

MENTAL ROVEMENT:

BEAUTIES AND WONDERS

OF

Nature and Art.

IN A SERIES OF

INSTRUCTIVE CONVERSATIONS.

BY

PRISCILLA WAKEFIELD,

Author of *Leisure Hours, &c. &c.*

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CONTENTS OF VOL. II.

<i>Origin of Navigation</i>	Page 2
<i>Mariners' Compass invented by a Neapolitan ..</i>	3
<i>Ancient Ships of uncommon Size</i>	4
<i>Simple Inventions of early Navigators</i>	5
<i>Dexterity of Savages in hunting and fishing</i>	7
<i>Unknown Seas explored by Drake and Cook....</i>	12
<i>Description of the Manner of Ship-building ...</i>	16
<i>Of the Materials used in forming the Hull</i>	18
<i>Of the Masts, Sails, and Rigging</i>	21
<i>Of the Provisions necessary for long Voyages ..</i>	26
<i>A simple Method of rendering Salt-water fresh .</i>	31
<i>Origin of the Crusades</i>	34
<i>A Description of the Tea Tree</i>	38
<i>Place and Manner of its Culture.....</i>	39
<i>Of the Cacao, or Chocolate Nut</i>	44
<i>The Method of cultivating it</i>	47
<i>Reasons bestowed to cure vicious Passions.....</i>	51
<i>Instanced in an Anecdote of Socrates.....</i>	52
<i>Description of the Coffee Tree</i>	53
<i>The Process of drying the Berries</i>	55
<i>Of China Ware, or Porcelain ..</i>	61
<i>Of its component Parts, and producing it ..</i>	66
<i>Of philosophical Instruments ..</i>	70
<i>Galileo the Inventor of the Telescope ..</i>	

<i>Herschel's great Improvement of it</i>	p. 76
<i>Immense Distance of the fixed Stars</i>	77
<i>Of the Microscope, and the Number of its Objects</i>	79
<i>The Harmony of the Works of Creation a Proof, of the Existence of one Supreme Being.</i>	80
<i>A Description of the Porcelain Manufactory</i> ..	88
<i>Of Enamel</i>	101
<i>Of Miniature Painting</i>	108.
<i>Of the Use of Vases</i>	111
<i>Of Decoys</i>	113
<i>Peculiarities of Wild-Fowl</i>	116
<i>Of Dogs used in Decoy-Ponds</i>	119
<i>Of Cruelty to Animals</i>	122
<i>The Dun Bird</i>	123
<i>Of Geese</i>	127
<i>Cruelty of plucking them</i>	128
<i>Of Feathers</i>	132
<i>Of Bird-catching</i>	138
<i>The Method of taking Ducks by the Gentoos</i> ...	139
<i>Artificial Method of hatching Eggs</i>	140
<i>Dangers of Bird-catching in the Orkney and Feroe Islands</i>	144
<i>Poetical Description of gathering Sapphire</i>	148
<i>Of Hawks</i>	149
<i>Peculiar Properties of various Birds</i>	152
<i>Of their Nests</i>	155
<i>The Taylor-Bird</i>	157
<i>Force of</i>	158
.....	159
	42

CONTENTS.

<i>An Idiot commanding Bees</i>	p. 170
<i>Of Bees' Wax</i>	183
<i>Of Manna</i>	188
<i>Floating Bee-Houses</i>	193
<i>Method of taking the Honey without d stroying the Bees</i>	196
<i>The Honey Guide</i>	197
<i>Of Mead</i>	201
<i>Medals</i>	203
<i>Method of taking Impressions from Medals</i>	210
<i>The Use of Money</i>	211
<i>Of Pasteboard Money</i>	213
<i>Mines of South America</i>	216
<i>The Mint</i>	217
<i>Manner of Coining at the Tower of London</i>	ib.
<i>Manner of coining at Birmingham</i>	220
<i>Medals</i>	223
<i>Gold and Gold Beaters</i>	224
<i>Gold Thread, &c</i>	228
<i>Spun Glass</i>	230
<i>Gold in Rivers</i>	234
<i>Quicksilver</i>	236
<i>Silver</i>	240
<i>Curious Experiment</i>	241
<i>Verdigrise</i>	242
<i>Of Brass</i>	243
<i>Bell Metal</i>	251
<i>Copper</i>	254
<i>Iron and Steel</i>	253
	- Chalchete

<i>Chalybeate</i>	p. 251
<i>The Loadstone</i>	251
<i>Tin</i>	251
<i>Pewter</i>	261
<i>Lead</i>	ib
— <i>Red and White</i>	261
— <i>Goulard</i>	264
— <i>Poisonous Quality</i>	266
— <i>Black</i>	ib

Mental Improvement, &c.

CONVERSATION XVI.

MR. HARCOURT.

OUR late conversations on the subject of the various kinds of timber, have led me to consider their extensive use in the building of ships, whether for the purpose of conveying us to the distant regions of the earth, or transporting the productions of one climate to its opposite extreme.

HENRY.

Pray, tell us how they first contrived to build a ship. It must be very curious to know the manner of putting the parts together on the water.

VOL. II.

AUGUST.

AUGUSTA.

I am far more desirous of being informed of the name of the man who had sufficient courage to venture upon so unstable an element.

MRS. HARCOURT.

A long period of time was necessary to bring either navigation, or the art of constructing vessels, to any degree of perfection. The first efforts were rude and imperfect. Observation taught the early inhabitants of the earth that light substances floated upon the surface of the water: experience, that sure but slow guide, instructed them that any thing would swim, that displaced a body of the fluid equal to its own weight. It is probable that the inhabitants of countries bordering on the sea, at first only ventured close along the shore, on a few planks fastened together, and pushed themselves along by the assistance of a stick or pole: repeated attempts suggested various improvements, till, by degrees, men became capable of building floating houses, and sailing in them to the most distant

distant regions of the earth. The advancement of science in general, still contributes to improve and perfect the invention of constructing vessels, and guiding them through the pathless ocean. That small instrument, the mariners' compass, said to be the contrivance of Flavio, a Neapolitan, about the beginning of the fourteenth century, has been of the greatest advantage in enabling persons at sea to know the course they are pursuing. It principally consists of a needle of iron, impregnated with the magnetic powers of the load-stone, which influences it always to point nearly to the north: thus, by being exactly acquainted with one of the cardinal points, it is easy to find out the others. As Charles is a better classical scholar than I am, I leave him to reply to Augusta's query.

CHARLES.

It is supposed that Neptune, called by the Pagans, god of the sea, was the founder of these inventions, and that his discovery was immortalized by attributing to him the dominion of the element he had subdued. Many
give

give the honour to Dædalus, and imagine that the wings he is said to have invented, to save himself from the resentment of Minos, king of Crete, whom he had offended, were nothing but sails, which he applied to the vessel in which he escaped; but all these accounts are uncertain. Scripture affords us some authentic records. Noah was certainly one of the earliest ship-builders, and the ark the first large vessel that is mentioned in history. Profane history relates an extraordinary account of two other ships of prodigious magnitude; the first built by order of Ptolemy Philopater, king of Egypt, which carried four thousand rowers, four hundred sailors, and three thousand soldiers; the other belonged to Hiero, king of Sicily, and was built under the direction of Archimedes. It contained all the variety of apartments belonging to a palace; banqueting-rooms, galleries, gardens, fishponds, stables, baths, mills, a temple of Venus, &c.; and, to render it complete, it was encompassed with an iron rampart,

rampart, and eight towers, with walls and bulwarks, furnished with machines of war.

MR. HARCOURT.

When the history of a very remote period records events that exceed rational belief, it is reasonable to suppose that the circumstance related was regarded as extraordinary at the time it happened; and that the historian, desirous of transmitting the fame of his native country to posterity, has enlarged the fact, and related it in the glowing colours of fiction. In this light I consider the description of Hero's vessel.—But to return to the simple inventions of the earliest navigators: the various tribes of savage nations, that inhabit the sea-coast, will throw the best light on the subject. Canoe is the name given to the little boats generally used by those who dwell in both Indies, as well as by the negroes in Guinea. They generally make them of the trunks of trees hollowed out, and sometimes of pieces of bark fastened together. They differ in size, according to the tree of which they are made: they are rowed with paddles,

something like the oars of a boat, and but rarely carry sails. The loading is placed at the bottom; but, as they have no ballast, they are frequently turned upside down. The want of a rudder, with which they are not furnished, is supplied by the hind paddles. The negroes of Guinea used the same sort of canoe, though made in a different manner: they are long-shaped, having only room for one person in width, and seven or eight in length, and show but little of the wood above the water. Those accustomed to row them are extremely dexterous, not only in striking the paddles with cadence and uniformity, by which the canoes seem to skim along the surface of the water, but also in balancing the vessels with their bodies, and preventing their overturning, which, without this address, must continually happen, from their extreme lightness; but, what is still more extraordinary, when this accident does occur, many of them have the dexterity to turn them up again even in the water, and remount them.

Mental Improvement.

CECILIA.

I have often remarked that savages show great ingenuity in their simple contrivances, and that they excel the inhabitants of civilized countries in personal address and dexterity. What European can vie with some of the Indians in running, when they pursue their game in hunting; or in patience, whilst they suffer the want of food, when they happen to be disappointed of obtaining it in the woods? The art with which they contrive stratagems in war, to deceive their enemies, shows great cunning and skill. Though I despise the principle, I admire the fertility of their invention. When I reflect upon their superiority in these things, I am discontented, because I cannot find a satisfactory reason why ignorance should excel knowledge in any thing.

MR. HARCOURT.

There are many causes why a savage should perform acts of skill and dexterity in a manner superior to a person whose mind has been enriched by the cultivation of science; but there can exist no instance of ignorance being

being preferable to knowledge. The intellectual powers of a savage, though capable of receiving the same impressions as a man of science, are, from want of education, confined to very few objects; on those he bestows his whole attention, and consequently attains a great degree of perfection in the things that belong to them. Do you not think that Charles would jump better than any of his acquaintance, if he passed whole days or weeks in no other occupation but that exercise.

CECILIA.

Certainly : I have no doubt of it.

SOPHIA.

The subsistence of savages depends so much upon their success in fishing and hunting, that, without skill in these arts, they must frequently be destitute of provisions: it is likely, therefore, that their whole education consists in attaining this dexterity. Although they manage their canoes with such surprising cleverness, I suppose they do not venture far out to sea.

MR.

MR. HARCOURT.

Seldom to a greater distance from shore than four leagues. They weave mats with rushes, of which they make the sails. On return from a voyage, the canoes are not left in the water, but drawn on shore, and suspended by the two ends, till they are dry, in which state they are so light that two men can easily carry them on their shoulders. Different causes have operated in forming the peculiar character of different nations. The narrowness and poverty of the land inhabited by the Phœnicians and Tyrians, combining with their natural genius for traffic, rendered them the first nation of navigators among the ancients. Lebanon and the other neighbouring mountains supplying them with excellent wood for ship-building, they were in possession of a numerous fleet, before other nations had acquired any knowledge in the art beyond that of coasting in small vessels. The commerce they established in foreign countries, with the means of their skill in naval affairs, enriched them to an extraordinary pitch

pitch of opulence. The employment given to such numbers of hands, by this enterprising and commercial spirit, increased the population of the country to such a degree, that they were obliged to found colonies in other countries, the principal of which was that of Carthage. In time, Carthage became more powerful than the mother country, and extended her navigation into Europe, as far north as Britain. The rivalry that subsisted between the states of Carthage and Rome, for many years, ended in the total destruction of the former, and left Rome without a competitor. This celebrated city in her turn became the prey of the Goths and Vandals, and with her fell, not only learning and the polite arts, but also the useful one of navigation declined rather than advanced for some time. The Crusades, that monument of human folly and enthusiasm, contributed to restore and accelerate the revival of commerce and navigation, by the number of vessels that were necessary to convey those vast armies into Asia, on this wild enterprise. The invention

vention of the compass, combined with the voyages of discovery and other causes, to promote the advancement of this useful branch of science and raise it to its present state.

CHARLES.

Which of the nations of Europe patronised the early voyages of discovery?

MRS. HARCOURT.

Had John II. of Portugal, listened to the proposal of Columbus, who was a native of Genoa, to give him encouragement to explore a passage to India, by sailing towards the West, across the Atlantic Ocean, that nation might have claimed this honour; but John treated this scheme with contempt; and Columbus, disgusted with his behaviour, quitted Portugal and went to Spain, in order to apply to Ferdinand and Isabella, who reigned conjointly at that time. Eight years were spent in repeated applications before he succeeded. At length, in August 1492, this great man, furnished with a small fleet of three ships, set sail, and steered directly for the Canary Islands; from thence he proceeded due

due west, through unfrequented and unknown seas; and after many difficulties arrived at Guanharic, one of the large cluster of islands called the Bahama Isles, and returned to Spain, without having obtained his principal object, of discovering another continent, which he supposed to exist on the western side of the globe. He made a second voyage without any better success. Undaunted by so many disappointments, he undertook a third voyage, and actually fell in with the vast continent of America; which, after all his indefatigable labour, received its name from a Florentine, Americus Vesputius, who only followed the footsteps he had marked out. Succeeding navigators made new discoveries; and Portugal at length saw the advantage of patronising these enterprises. It does not seem that our countrymen turned their attention this way till a later period. In 1577, Sir Francis Drake undertook and completed a voyage round the world, in about three years. Our late discoveries have been principally in the Pacific Ocean; and, to the honour of the
British

British nation, the name of Captain Cook will ever remain distinguished among the chief navigators. It was not the thirst of digging the gold from the mine, but the desire of diffusing the arts and advantages of civilization among his fellow-creatures, that induced him to explore unknown seas. He wandered from one nation of strangers to another, offering the olive-branch of peace, and desired rather to form an alliance of friendship with them, than to oppress them by tyranny and injustice.

CHARLES.

Although England is now celebrated for the superiority of her navy, it appears that the northern parts of the world were slow in attaining this perfection; for, when Cæsar invaded Britain, the natives opposed him in vessels of an odd form, like large tubs: the sails were composed of leather, and iron chains supplied the place of cables.

MRS. HARCOURT.

The Saxons, after being some time settled in this island, became sensible that its surest de-

fence would be a formidable navy, and applied themselves vigorously to build ships of war. Ethelred, in order to maintain a powerful force at sea, made a law, that whoever possessed 300 hides* of land should build and man one ship, for the defence of his country. Our insular situation has obliged us to bestow greater attention in improving and advancing the art of ship-building to perfection. It is also our best policy to encourage a nursery of British seamen, which is done in part by the numbers that are employed in the Newcastle colliers, and other trade fleets. This is the reason that coal-pits in the neighbourhood of London are not suffered to be worked. The superiority of the British fleet, for strength and beauty, as well as for the bravery of its mariners, is undisputed, and our nation has long been considered as mistress of the sea.

SOPHIA.

In the reign of queen Elizabeth our royal navy was in a very flourishing condition.

A hide of land was formerly reckoned 100 acres.

MR.

MR. HARCOURT.

The progress of commerce and navigation naturally keep pace together. Trade first gave occasion to the fitting out large fleets of ships, and as that increased, the cargoes became more valuable, and each nation, jealous of her property, found ships of war necessary to convoy her merchantmen in safety to their destined ports. Ships, intended for different purposes, required a variety of forms and sizes, as well as a diversity of construction and rigging. The form of fishes being admirably adapted to divide the fluid element, and make a way through the waters, furnished hints to ship-builders in forming the bulks of vessels. Naval architecture comprehends three principal objects. In the first place, it is necessary to give the ship such an exterior form as may be best suited to the service for which she is designed. Secondly, to find the proper figures of all the pieces of timber that compose a ship. And lastly, to provide suitable accommodations for the officers and crew, as well as for the cargo, furniture, provisions, artillery

artillery, and ammunition. A ship of war should be able to sail swiftly, and carry her lower tier of guns properly. It is necessary for a merchant-ship to contain a large cargo of goods, and be navigated with few hands; and each kind should be able to carry sail firmly, steer well, drive little to leeward, and sustain the shocks of the sea without being much strained. Charles, you have visited a dock-yard; can you give your brother a satisfactory account of the method used in building ships?

CHARLES.

The vessels that I saw buikling were supported in the dock, or upon a wharf, by a number of solid blocks of timber, placed parallel, and at equal distances from each other, The workmen call this being on the stocks.

MR. HARCOURT.

This is an answer to your enquiry, Henry, how they contrived to build ships upon the water. Hed you reflected a moment, you would not have asked such a silly question.

HENRY.

HENRY.

I asked without considering that it would be impossible. Forgive me, if I am now desirous of knowing how such large bodies are removed into the water.

MRS. HARCOURT.

I commend a proper curiosity; but, in future, before you ask a question, consider whether it be a reasonable one, and whether, by reflecting on the subject, you cannot resolve it yourself. When they begin to build a ship, it is supported upon strong platforms, inclined towards the water. All things being ready for the launch, the wedges and supporters are cut away, and the parts over which the vessel is to pass are well daubed with grease and soap, to make her slide more easily. Every obstruction being removed, by degrees she slides into the water. Very large vessels are frequently built in dry docks, and when finished, the flood-gates of the dock-yard are opened, and the water rushes in and raises the vessel to the surface. Charles, are you able to recollect the principal parts that compose a
c 3 ship?

ship? I took some pains to make you master of the subject.

CHARLES.

It is a difficult one; but I will endeavour to give the company the clearest idea of them in my power. The first piece of timber laid upon the block is generally the keel; the pieces of the keel are scarped together, a term used for fastening large pieces of timber together in a manner somewhat similar to what the carpenters call dove-tail: thus united, they form one entire piece, which constitutes the length of the vessel below. At one extremity of the keel is erected the stem, which is a circular piece of timber, into which her two sides are fixed at the fore end: at the other extremity of the keel is elevated the stern-post, into which are fastened the after-planks, and in the stern-post hangs the rudder. The transoms and fashion-pieces are large pieces of timber that form the width of the ship. These being strongly united into one frame, are elevated upon the stern-post, and the whole forms the structure of the stern, upon which

which the galleries and windows, with their ornaments, are afterwards built. The stern and stern-post being thus elevated upon the keel, and the keel being raised at its two extremities by pieces of wood, the midship-floor timber is placed across the keel. The floor timber, both before and abaft* the midship frame, is then stationed in its proper place upon the keel; after which the kelson, which is the next piece of timber to the keel, and lying directly over it, is fixed across the middle of the floor timber. The futtocks, or ribs, which form the sides, are then raised upon the floor timbers, and the top timbers being afterwards fastened to the head of the futtocks, completes the exterior figure of the whole.

MR. HARCOURT.

Considering the subject is so intricate, you have described it with tolerable clearness.

MRS. HARCOURT.

You have given us an idea of the external

* *Ab.* a sea term for behind.

Mental Improvement.

gure of a ship. The inside finishing also requires a great deal of art. It is divided into several decks or floors, destined to different uses. Large ships have three decks; smaller but two; and there are vessels that are only half decked. The decks are divided into several apartments. The best cabin, (for there are sometimes more than one,) corresponds with the drawing-room of a house, and is appropriated to the reception of visitors. The cuddy serves for an eating parlour. There is also, on board an Indiaman, a cabin behind the cuddy, called the round-house. Besides these, separate apartments are provided for the different officers, as cook-room, gun-room, &c. &c.

HENRY.

Do they lie in such beds as we do?

MRS. HARCOURT.

They would find them very inconvenient, on account of the motion of the ship. They use hammocks at sea, which are beds hung to the ceiling; and they swing backwards and forwards as the ship rolls.

MR.

MR. HARCOURT.

A ship is very imperfectly described without naming the masts, sails, and rigging. The masts are very tall poles fixed in the deck, to which are attached the sails and the rigging. The sails are generally made of a peculiar kind of coarse hempen cloth, and their use is to gather the wind, by the force of which the vessel is driven along. The rigging is composed of ropes, and serves to furl and unfurl the sails as occasion requires; it also forms a sort of rope-ladders, by which the expert mariners ascend to the top of the mast.

CECILIA.

It must require a vast sum of money to build a ship.

MR. HARCOURT.

A man of war of 74 guns is calculated to cost 30,000*l.* before she is armed or equipped.

CHARLES.

What an immense sum must be requisite to raise and maintain a fleet! Into how many orders or ranks is the British fleet divided?

MRS.

MRS. HARCOURT.

It is distributed into six rates, exclusive of the inferior vessels that usually attend our naval armaments; as sloops of war, armed ships, bomb-ketches, fire-ships, &c. Ships of the first rate mount an hundred cannon: they are manned with 850 men, including officers, seamen, marines, and servants. A captain of a man of war, when on board, is an absolute sovereign, and rules with unlimited sway; but on his return is liable to give account of his conduct in a court-martial, as it is a principle of the British constitution, that every subject, of whatever rank, if injured at sea or land, has an equal right to redress.

AUGUSTA.

Pray what difference is there in the meaning of the words ship and vessel?

MRS. HARCOURT.

Vessel comprehends all floating machines that move in water. We distinguish them into two general classes; high-bottomed, or decked vessels, which are those that move wholly with wind and sail, and live in all

seas -

seas ; and flat-bottomed vessels, which go both by oars and sails, such as boats, barges, wherries, &c.

HENRY.

You mentioned a rudder just now. I do not know what it is.

MR. HARCOURT.

The rudder is a piece of timber suspended to the stern-post, by which the vessel is guided, in this or that direction, according as the sides of the rudder are opposed to the water. An anchor is a large, strong piece of iron, crooked at one end, and formed into two barbs, resembling a double hook, and fastened at the other end by a cable. Its use is to keep the vessel confined to one place, by letting it down into the ground.

MRS. HARCOURT.

As it is sometimes their last resource in time of danger, it is considered as emblematical of hope, which is frequently represented by a female figure, resting upon an anchor, and looking up to Heaven for deliverance.

SOPHIA.

SOPHIA.

Are not flags displayed on the masts of ships, to denote to what nation they belong?

MR. HARCOURT.

They not only serve that purpose, but also distinguish the rank of the admiral or commander on board. In the British navy the flags are either red, white, or blue. The admiral or commander-in-chief carries his flag on the foremast, and that of the rear-admiral is carried on the mizen-mast. Different signals are used at sea, according to circumstances; and, during an engagement, the orders of a commander are given and understood with wonderful precision.—James II. is said to have invented the principal signals used in our fleet.

CECILIA.

I cannot imagine how the poor sailors avoid running against the rocks in a dark night.

SOPHIA.

Light-houses are erected in proper situations, to warn them of their danger, where

such large fires are made as to be visible at a considerable distance. The Pharos of Alexandria was a building of this kind. It was esteemed one of the seven wonders of the world, on account of the beauty of its structure, and the richness of its materials. It stood on a small island at the mouth of the Nile, and consisted of several stones raised one over another, adorned with columns, ballustrades, and galleries, of the finest marble and workmanship; to which account some writers add, that the architect contrived to fix mirrors so artfully against the highest galleries, that all the vessels that sailed on the sea for a considerable distance, were reflected in them.

MRS. HARCOURT.

The clock strikes, and warns us that it is time to retire. Henry has been so attentive that I expect he will dream of undertaking a voyage.

HENRY.

I wish I may: by that means I should enjoy the pleasure without partaking of the danger.

MRS. HARCOURT.

Good night, my little, sleepy sailor. Adieu, dear children.

CONVERSATION XVII.

HENRY.

I HAVE longed all the day for the time of meeting. I have been thinking of several things concerning ships, which appear wonderful to me. In the first place, I cannot imagine how they contrive to store up provisions for so many people for several months without spoiling. We are obliged to go to market almost every day; but you know there are no shops at sea.

MRS. HARCOURT.

Consequently the ship's crew cannot live on fresh meat; neither can they procure fresh vegetables, which, with the want of fresh water, are the principal causes of that dreadful dis-

disease, called the sea-scurvy, to which persons on long voyages are very subject. Beef and pork, well salted down, with hard biscuit, form the usual food of a sailor.

AUGUSTA.

I cannot eat either salt meat or hard biscuit. What would become of me, were I obliged to go to a very distant country?

SOPHIA.

Necessity, my dear Augusta, has taught many to submit to great hardships. Suppose your father were obliged to go to the West-Indies, would you prefer being separated from him, or attending him thither, and suffering some inconveniences for a few weeks: surely you would not hesitate which to chuse?

AUGUSTA.

My father frequently tells me that it is not unlikely that his affairs will require his presence in Jamaica. I have entreated him to let me go with him; but I never considered the difficulties of the voyage. Accustomed as I have been to a variety of dishes every

day at table, and a dessert of fruit and preserves afterwards, I should find it hard fare to dine on salt beef and biscuit, and to exchange my soft bed for a hammock.

MR. HARCOURT.

This confession shows the great inconvenience of an habitual indulgence in our mode of living. Had you been used to eat only of one dish, and sleep upon a mattress, you might easily have accommodated yourself to an alteration for the worse for a little time. Temperance is not only a virtue, but a great advantage to health, and on many occasions diminishes the difficulties we are liable to meet with. One reflection ought to be sufficient to reconcile us to any temporary hardship: that thousands of our fellow-creatures suffer daily, what we think so painful to undergo for a few hours. The consideration of these things will teach us to transfer a little of that solicitude for our own personal enjoyment, to a tender care for the wants and sufferings of others.

CHARLES.

The captains and officers have their tables
supplied

supplied with fresh provisions: sheep, pigs, and poultry are kept on board ships for that purpose. I have also seen a cow, which afforded milk and cream for the captain's table. Minced meat and sweet-meats are generally among his stores, and any other delicacy that will keep; therefore, Augusta, you may lay aside your apprehensions, for although you could not enjoy all the luxuries you do at home, you may make a tolerable shift for a month or two.

CECILIA.

The comparison of my condition, and that of the poor sailors, would prevent my enjoyment of the indulgencies that my superior rank procured me.

MRS. HARCOURT.

Bring that principle home to your own heart. You constantly enjoy many gratifications, that our poor neighbour, Mary Benson, has not even an idea of.

CECILIA.

That very thought reconciles me to the difference; but were she a spectator of my daily
D 3 meals,

meals, and obliged to rest contented with her present scanty fare, I should be induced to go shares with her.

MR. HARCOURT.

Our wants vary according to our habits and education. Let us be careful not to increase them by pampering a false taste for unnecessary indulgence. A life of hardship is not confined to sailors: many employments subject those who are engaged in them to endure it patiently. Miners are deprived of light, and the society of the rest of mankind. Those who work in the quicksilver mines are said not only to lose their health, but generally die in a few years. Extremes of heat and cold, hard labour, and scanty fare, are the portion of the greater part of mankind. But happiness does not depend upon the enjoyment of luxury. These people possess as large a share of it as their richer and envied neighbours: each condition has its advantages. We are the children of one common Parent, who has deemed it wise to distribute mankind into different ranks and orders in society, and

to render the poor and the rich dependent on each other, that they may be united by the powerful tie of reciprocal benevolence and affection.

SOPHIA.

I believe I should suffer most from want of fresh water. What contrivance do they use as a substitute for this necessary comfort?

MR. HARCOURT.

Many ingenious philosophers have bestowed much time and attention to remedy this defect. The simplest and best method of distilling sea-water, and rendering it fresh, is the invention of Dr. Living. In order to have a clear idea of his method of accomplishing this desirable purpose, suppose a tea-kettle to be made without a spout, and a hole in the lid in the place of the knob: let this kettle be filled with sea-water, the fresh vapour which arises from the sea-water, as it boils, will issue through the hole in the lid: fix the mouth of a tube in that hole, and the vapour of fresh water will pass through the tube, and may be collected, by fitting a proper vessel to receive it to the
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end of the tube. Dr. Irving, in a similar manner, has adapted a tin, iron, or copper tube, of suitable dimensions, to the lid of the common kettle, used for boiling the provisions on board a ship. The fresh vapour, which arises from boiling sea-water in the kettle, passes through this tube into a hogshead, which serves as a reservoir.

CHARLES.

This is ingenious, and may alleviate the evil in a degree; but I cannot suppose it can be so agreeable as clear, fresh water from a spring; and it must be scarcely possible to procure a sufficient quantity for the comfortable accommodation of so many persons.

MRS. HARCOURT.

Fresh water is often far more precious than the richest wines on board a ship. The poor men have frequently been obliged to be limited to a certain quantity of it a day. True riches consist in a sufficiency of those things that are necessary to our life and health. Of what use would gold be to a man in a desert?

A cup

A cup of cold water, or a sack of corn, would be, in comparison, an inestimable treasure.

CECILIA.

Surely it must be difficult to preserve the health of persons confined long on board, especially in warm climates.

MR. HARCOURT.

A considerate, humane commander, pays great attention to the health and morals of his ship's company. Cleanliness, and the free admission of fresh air between decks, are points of the utmost importance, as well as a sufficient supply of such vegetable food as can be procured; as peas, oatmeal, &c. After every precaution that can be taken, there are inconveniences peculiar to this manner of life.

HENRY.

The desire of seeing foreign countries, with the different manners and customs of the inhabitants, would influence me to face every danger, and overcome every difficulty.

MRS. HARCOURT.

Henry is quite a hero. Many have felt
an

Mental Improvement.

an invincible inclination for going to sea, which cannot be accounted for, on any other principles, than that men are formed with various propensities, adapting them to a variety of pursuits. Were it otherwise, all men would chuse the easiest profession, and no one would be found to undertake any employment that threatened either difficulty or danger.

AUGUSTA.

In relating the progress of navigation, crusades were mentioned. I should be glad to be informed what they were, as I am entirely ignorant of the meaning of the word.

MRS. HARCOURT.

Towards the end of the eleventh century, the zeal of a fanatical monk, called Peter the Hermit, who conceived the idea of leading all the forces of Christendom against the infidels, and of driving them out of the possession of the Holy-Land, was sufficient to give a beginning to this wild undertaking. He ran from province to province, with a
crucifix

crucifix in his hand, exciting princes and people to this holy war. Wherever he came, they caught the infection of his enthusiasm. Not only nobles and warriors, but men in the more humble stations of life: shepherds left their flocks, and mechanics their occupations; nay, even women and children engaged with ardour in this enterprise, which was esteemed sacred and meritorious. Contemporary authors assert, that six millions of persons assumed the cross, which was the badge that distinguished such as devoted themselves to this holy warfare. But from these expeditions, extravagant as they were, beneficial consequences arose, which had neither been foreseen nor intended. It was not possible for the crusaders to travel through so many countries without receiving information and improvement, which they communicated to their respective countries at their return. The necessary provision and accommodation for such vast numbers of people excited a spirit of commerce, and in its consequences advanced the progress of navigation. A spirit
of

of improvement is raised by the communication of different nations. Those people who are destitute of commerce, remain a long time stationary.

SOPHIA.

How often do we see good arise out of apparent evil! Who could have supposed that the mistaken enthusiasm of an obscure monk could have been productive of such public benefit.

MR. HARCOURT.

It is useful to trace things to their causes. Many events that have made great noise in the world, have arisen from causes apparently trifling and inadequate to the effect produced. The means of introducing the Reformation into this country, with all its happy consequences, was the unlawful love of Henry VIII. for Anne Boleyn. He sought only his own gratification; but the hand of Providence converted his corrupt inclinations into an instrument of good to his people. Discoveries in the arts have frequently been the result of accident. This should teach us the habit of

observation. The bulk of mankind observe little, and reflect less, which accounts for many persons in advanced life having few ideas of their own.

CECILIA.

You have so often inculcated the advantage of observing the nature and texture of every thing we use, that it becomes an amusing custom, when we are by ourselves, to question each other on the qualities of those things that attract our notice. This morning, at breakfast, tea, coffee, and chocolate, were the subjects of enquiry. None of us were capable of giving a good account of them, without having recourse to books for information. We each chose our topic; and I believe Henry can inform us in what manner coffee is cultivated and prepared. Charles selected the cacao-tree for his investigation. The tea-tree of course fell to my share.

MRS. HARCOURT.

Pray let us be amused with the result of your researches. Cecilia, your brothers will not take the lead; they resign the precedence to you.

CECILIA.

The tea-tree, according to Linnaeus, is of the polyandria monogynia class. The cup is a very small, plane, permanent perianthium, divided into five or six roundish obtuse leaves. The flower consists of six or nine large, roundish, concave, and equal petals: the stamina are numerous filaments, about two hundred, and are very slender, capillary, and shorter than the flower: the anthera are simple: the germen of the pistil is globose and trigonal: the style is subulated, and of the length of the stamina: the stigma is simple: the fruit is a capsule, formed of three globular bodies, growing together; it contains three cells, and opens into three parts at the top: the seeds are single, globose, and internally annulated. It is supposed that there is but one species of this tree, and that the difference between green and bohea tea, consists only in the manner of cultivation, and drying the leaves. The root resembles that of the peach-tree: the leaves are long and narrow, and jagged all round: the flower is much like that of the
wild

wild rose, but smaller : the fruit contains two or three seeds of a mouse-colour, including each a kernel ; these are the seeds by which the plant is propagated ; several of these are put promiscuously into a hole, four or five inches deep, at proper distances from each other, and require no other care. In about seven years, the shrub rises to a man's height, which it seldom greatly exceeds.

MR. HARCOURT.

You have forgotten to tell us of what country this shrub is a native.

CECILIA.

It is cultivated in Japan, and grows abundantly in China, where whole fields are planted with it, as it forms a very extensive article of commerce among the Chinese. It loves to grow in valleys, at the foot of mountains, and upon the banks of rivers, where it enjoys a southern exposure to the sun ; though it endures considerable variations of heat and cold, flourishing through the different degrees of climate in the extensive kingdom of China. Sometimes the tea-trees grow on the steep de-

clivities of hills, when it is dangerous, and in some cases impracticable, to get at them. The Chinese are said to make use of the large monkeys, that dwell among these cliffs, to assist them in obtaining the valuable leaves of the tea-trees. They irritate these animals; and, in revenge, they climb the trees and break off the branches, and throw them down the precipice, which gives the gatherers an opportunity of reaching them.

AUGUSTA.

What part of this shrub is applied to our use?

CECILIA.

The leaves constitute the tea we use. The best time to gather them is whilst they are small, young, and juicy; they are plucked carefully one by one; and, notwithstanding the tediousness of this operation, the labourers are able to gather from four to fifteen pounds each, in one day. The buildings, or drying houses, that are erected for curing tea, contain from five to twenty small furnaces, each having at the top a low, flat, iron pan. There is
also

also a long, large table, covered with mats, on which the leaves are laid, and rolled by workmen, who sit round it. The iron pan being heated, to a certain degree, by a little fire made in the furnace underneath, a few pounds of the fresh-gathered leaves are put upon the pan: the fresh and juicy leaves crack when they touch the pan; and it is the business of the operator to shift them as quick as possible with his bare hands, till they become too hot to be endured. At this instant he takes off the leaves with a kind of shovel, and puts them on the mats before the rollers, who, taking small quantities at a time, roll them in the palms of their hands, in one direction, while others are fanning them, that they may cool the more speedily, and retain their curl the longer. This process is repeated two or three times, or oftener, before the tea is put into the store, in order that all the moisture of the leaves may be thoroughly dissipated, and their curl more completely preserved. On every repetition the pan is less heated, and the operation performed more slowly

and cautiously : the tea is then separated into the different kinds, and deposited in the store for domestic use or exportation. The Chinese drink tea more frequently than the Europeans : it is the chief treat with which they regale their friends : and it is said that it is a branch of polite education in that country to learn to infuse and serve it gracefully. It was introduced into Europe very early in the last century, by the Dutch East India Company. About the year 1666, a quantity of it was imported from Holland by Lord Arlington and Lord Ossory, at which time it was sold for sixty shillings a pound. The present consumption of it is immense, nineteen millions of pounds being annually imported since the Commutation Act took place.

SOPHIA.

I think this agreeable beverage is reckoned unwholesome.

CECILIA.

The faculty reckon it very much so to some constitutions, particularly low, nervous habits ; at the same time, they allow that the

same quantity of warm water might be nearly as prejudicial ; therefore I am willing to drink it cool, provided I may be permitted to enjoy this enlivening repast, which always seems superior in sociability and cheerfulness to every other meal in the day.

MR. HARCOURT.

At the same time that you mention its pernicious qualities, it is but fair to remark, that it is in some cases valued as a medicine, and is acknowledged to be the most powerful restorative to the spirits after fatigue of body or mind.

MRS. HARCOURT.

The general use of it among the poor and laborious part of mankind, I consider baneful to them in many respects : it consumes a large part of their scanty earnings, that might be expended in more nutritious food, and though it gives a temporary animation to their wearied spirits, it is not capable of renewing their strength, exhausted by the fatigues of the day. The same money laid out in milk would be more beneficial and nourishing to themselves
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14 *Mental Improvement.*

and their infants. Not that I would wholly deprive them of this solace; but I believe it would rebound to their advantage, if it were only used occasionally, by way of treat.

CECILIA.

I have no addition to make to my account; therefore I hope Charles is ready to begin.

CHARLES.

The cacao, or chocolate-nut, is a native of South-America, and is said to have been originally conveyed to Hispaniola from some of the provinces of New Spain, where it was not only used as an article of nourishment by the natives, but likewise served the purpose of money, being employed as a medium in barter: one hundred and fifty of the nuts were considered as nearly equivalent to a ryal by the Spaniards. It is a genus of the polyadelphia pentandria class. The flower has five petals, and five erect stamina: in the centre is placed the oval germen, which afterwards becomes an oblong pod, ending in a point, which is divided into five cells, filled with oval, compressed, fleshy seeds. The cacao-tree.

tree, both in size and shape, has some resemblance to a young black-heart cherry-tree. The flower is of a saffron colour, extremely beautiful: and the pods, which, when green are much like a cucumber, proceed immediately from all parts of the body and larger branches. Each pod may contain from twenty to thirty nuts or kernels, not unlike almonds. These nuts are first dried in the sun, and then packed for market; and after the parchment shell that encloses them is taken away, they require but little preparation to make them into good chocolate.

HENRY.

You are not to be let off so easily, Charles: you must give us an account of the process.

CHARLES.

The Spaniards were the first that introduced the use of chocolate into Europe. The method of preparing it, first practised by them, was very simple, and the same with that in use among the Indians. They only use cacao, maize, and raw sugar as expressed from the canes, with a little achiotl, or roco, to give it a colour:



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Colour : of these four drugs, ground between two stones, and mixed together in a certain proportion, they made a kind of bread, which served them equally for solid food and for drink, eating it when hungry, and steeping it in hot water when thirsty. The Spaniards have since added many ingredients in the composition of their chocolate, which are thought to add but little to its quality. In England the chocolate is simply ground, with but little other addition than sugar, and vanilla, which is the fruit of a plant cultivated in South America. These ingredients together are made up into such cakes as we see in the grocers' shops. When purchased for domestic use, it requires to be boiled in water, milk, or water-gruel : when sufficiently boiled, it is milled, or agitated with a wooden machine for the purpose, and boiled again, in order to froth it, then mixed with sugar and cream. It forms a favourite breakfast at the tables of the opulent, and serves to gratify their taste for variety.

MR. HARCOURT.

Your account has hitherto been very entertaining; but I hope you can furnish us with the manner in which this beautiful and useful tree is cultivated, as I have been told there are but few vegetables that require more care to rear and bring to maturity.

CHARLES.

The first business of the planter is to chuse a suitable spot for the purpose. A deep, black mould is the soil best adapted to the growth of the chocolate-tree. It should be a level piece of land, sheltered round with a thick wood, so as to be well screened from the wind, especially the north. After having cleared it from all manner of stumps and weeds, the planter digs a number of holes, at eighteen or twenty feet distance. Having previously selected the largest and fairest of the pods of the cacao, when full ripe, he takes out the grains, and puts them into a vessel of water. Such of them as swim he rejects; the others, being washed clean from the pulp, and skinned, are suffered to remain in the water till they begin
to

to sprout, when they are fit for planting. His next work is to take the leaves of the banana, or some other large leaf, one of which he places in the circumference of each hole, so as to line it withinside, leaving the sides of the leaf some inches above the ground; after which he rubs the mould in very lightly, till the hole is filled. Three nuts are then chosen for each hole, and planted triangularly, by making a small opening for each with his finger, about two inches deep, into which he puts the nuts, with that end downwards from which the sprout issues; and having lightly covered them with mould, he folds the edges of the leaf over them, and places a small stone on the top, to prevent its opening. In the space of about eight or ten days, the young shoots begin to make their appearance above the earth, and call once more for the attendance of the planter, who unfolds the banana leaves, that the growth of the tender plant may not be impeded. In order to shelter them from the sun, other leaves or branches are placed round the hole, and they are changed as often

as they decay, during five or six months. Such tender care does the cacao require, and so requisite is shade to its growth and prosperity, that, besides the precautions I have mentioned, they are obliged to plant some other tree to the south-west of the plant, which may grow up with it, and serve it for shelter against the scorching rays of the sun: the erythrina, or bean-tree, is generally chosen for this purpose. In the fifth year it begins to repay the cultivator for his trouble, and by the time it has stood eight years, attains its full perfection. It generally produces two crops of fruit in the year, and will sometimes continue bearing for twenty years. The same delicacy of stamina, which marks its infancy, is apparent in all the stages of its growth; for it is obnoxious to blights, and shrinks from the first appearance of drought; and the greatest part of a whole crop of cacao-trees have been known to perish in a single night, without any visible cause.

AUGUSTA.

I am surprised that any person has the pa-

tience and perseverance to cultivate a shrub that requires so much pains, and after all, so liable to disappoint the hopes of those who have reared it, at the expence of such a great deal of time and labour.

MRS. HARCOURT.

I imagine that the profit it brings, when it succeeds, is the inducement to the attempt. Nothing is to be effected without pains and labour. We cannot learn the simplest mechanical operation without repeated efforts. Consider what numberless attempts an infant makes to walk or speak, before it can either articulate a perfect sound, or proceed a few steps by itself. In the same manner, the habit of performing most of the common operations of the body, which we practise, as it were insensibly, when we have arrived at maturity, are acquired by almost imperceptible degrees. A child learns to judge of the distances of objects by experience, as of the distance and nature of sounds. The powers of smelling, feeling, hearing, and seeing, exist in a new-born infant, though a considerable space

of time passes before it is capable of reaping much benefit from them : repeated and continual practice at length enables it to see, hear, taste, feel, and smell, with accuracy and precision, if it be born with perfect organs. This should teach us never to despair of attaining any degree of perfection in virtue or knowledge, of which our nature is capable. If indolence, pride, avarice, or anger, are the leading propensities of a man's disposition, let him war with determined resolution and unremitting care against that particular vice to which he feels himself prone, and he will certainly come off victorious in the combat. Resistance against a predominant inclination is at first painful ; by repetition it is rendered easy ; and in time the practice of the opposite virtue becomes delightful.

MR. HARCOURT.

The possibility of overcoming vicious inclinations, and correcting what is commonly called our nature, is finely exemplified in the story of Socrates and the physiognomist. A man, who pretended to discover the charac-

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teristic marks of the dispositions and affections, by the lines of the face, was introduced to Socrates, without knowing the philosopher, and desired to declare, by the rules of his art, what kind of person Socrates was. He replied, after observing his countenance attentively, that he was a drunkard and a glutton, passionate, and a slave to vice in general. Upon which the company ridiculed his want of discernment, and denied all dependence on the truth of physiognomy ; but Socrates reproved their rashness, acknowledging that in his youth he felt himself powerfully inclined to the very vices the man had named, but that resolution and perseverance had enabled him to overcome them ; and all present knew that he had attained such command over himself, as to be celebrated as a model of virtue and morality. My dear Henry must lay aside his intention of entertaining us with the history of coffee, till to-morrow evening. It is too late to begin a fresh subject. Adieu ; adieu.

CONVERSATION XVIII.

MRS. HARCOURT.

I HAVE not forgotten that little Henry is to open the conversation to-night, with an account of the peculiarities of the coffee-tree. Pray, try to repeat the botanical definition properly. Speak clearly and distinctly; and arrange your ideas in order: if your memory should fail, your father or Sophia will assist you with pleasure; therefore be encouraged to proceed. We are all attention.

HENRY.

After such kind encouragement from my dear mother, I have no excuse for declining the performance of my promise, though I feel myself scarcely equal to the task. The coffee-tree is a genus of the pentandria monogynia class. The flower has one petal, which is funnel-shaped; it has five stamina, which are

fastened to the tube, the roundish green afterwards becomes an oval berry, containing two seeds, in shape like a half globe. flat on one side, and convex on the other. This tree originally came from Arabia Felix, but is now cultivated with success in the British West-Indies. It is a low tree, even in its native soil seldom exceeding sixteen or eighteen feet high. In the West-India islands the negroes are employed to gather the berries. As soon as they change their colour to a dark red, they are fit for gathering. Each negro is provided with a canvass bag, with a hoop in the mouth of it to keep it open: it is hung about the neck of the picker, who occasionally empties it into a basket; and if he be industrious he may pick three bushels in the day. One hundred bushels in the pulp, fresh from the tree, will produce about one thousand pounds weight of merchantable coffee.

MR. HARCOURT.

You have given us a very clear account of this tree, and the manner of gathering the ber-

ries: you must next inform us of the method used in drying them.

CHARLES.

There are two methods in use of curing or drying the bean. The one is to spread the fresh coffee in the sun, in layers about five inches deep, on a sloping terrace or platform of boards, with the pulp on the berry, which in a few days ferments and discharges itself in a strong acidulous moisture; and in this state the coffee is left till it is perfectly dry, which, if the weather be favourable, it will be in about three weeks. The husks are afterwards separated from the seeds by a grinding mill, or frequently by pounding them with pestles, in troughs, or large wooden mortars. The other mode is to pulp it immediately as it comes from the tree, which is done by a pulping mill: the pulp and the bean (in its parchment skin or membrane which encloses it) fall promiscuously together. The whole is then washed in wire sieves, in order to separate the pulp from the seeds: the latter are then spread open in the sun to dry. After this follows

the operation of grinding off the parchment skin which covers the bean, and is left after the pulp is removed: when it appears sufficiently bruised it is taken out of the trough and put to the fan, which clears the coffee from the chaff, and the seeds remaining unground are separated by sieves, and returned to the mill, which finishes the process.

MRS. HARCOURT.

The coffee-berries are generally roasted before we use them. They are put into a tin cylindrical box, full of holes, through the middle of which runs a spit. Beneath this machine is placed a semicircular hearth, in which is lighted a large charcoal fire: by the help of a jack the spit turns swiftly, and in that manner roasts the berries equally. When the oil rises, and is become of a dark brown colour, it is emptied into two reservoirs, the bottoms of which are iron plates: then the coffee is shaken, and left till almost cold; and if it looks bright and oily, it is a sign it is well done. Sophia, you are, doubtless, acquainted with the manner of boiling it for use.

SOPHIA.

Take as many berries as you want, and grind them to a fine powder in an iron coffee-mill. Infuse this powder in a suitable proportion of boiling water: let this infusion just boil again and stand till it is clear, and pour it off for use. The addition of cream and sugar heightens and improves the flavour.

CECILIA.

The Turks are remarkably fond of coffee; they flavour it with cloves, or essence of ambergris: and so essential do they deem it to their comfort, that it is one of the necessaries with which a Turk is obliged to furnish his wife.

MR. HARCOURT.

Avarice has invented many substitutes for coffee. Peas, beans, rye, and barley, when roasted, yield an oily matter, resembling it in a degree, but much inferior in strength and flavour.

AUGUSTA.

Many other things are sent to this country
from

from the West-Indies, besides sugar, coffee, and chocolate.

CHARLES.

Ginger is produced there in abundance. There are three species: the first, which is the common ginger, is cultivated for sale in most of the islands in America, but is a native of the East-Indies, and also of some parts of the West-Indies, where it is found growing naturally, without culture. The dried roots of this sort furnish a considerable export from the British colonies in America. The only distinction between the black and the white ginger consists in the different modes of curing the roots. The black is rendered fit for preservation by means of boiling water, and the white by exposing it to the sun. As it is necessary to select the fairest and soundest roots for this purpose, white ginger is commonly one third dearer than black in the market.

MR. HARCOURT.

This root is planted much in the same manner as potatoes in Great-Britain, but is

only fit for digging once a year, unless for the purpose of preserving it in syrup ; in that case it must be taken up at the end of three or four months, whilst its fibres are tender and full of sap.

HENRY.

Preserved ginger is a nice sweetmeat. I remember we had some of it at the entertainment given on account of Sophia's birth-day.

MRS. HARCOURT.

Most of the preserves that come from the West-Indies are excellent, owing to the fineness of the sugar of which they make the syrup, which, whilst it prevents the fruit from decaying, does not destroy its flavour or colour.

CHARLES.

What are the principal commodities returned from England to the West-Indies, in exchange for the things we receive from thence?

MR. HARCOURT.

The manufacturers of Birmingham and Manchester; the clothiers of Yorkshire,
Glouces-

Gloucestershire, and Wilts; the potters of Staffordshire; the proprietors of all the lead, copper, and iron works; have a greater vent in the British West-Indies for their respective commodities, than they themselves, perhaps, conceive to be possible. The export of the coarser woollens to the torrid zone, for the use of the negroes, is prodigious. Even sugar itself, the great staple of the West-Indies, is frequently returned them in a refined state, and thus furnishes an article of commerce in a double way.

MRS. HARCOURT.

Commerce and traffic, either between nations or individuals, may be divided into two great articles, under one of which all the rest may be classed; viz. the raw material, or natural substances, before they are changed or transformed by the inventions of art; such as corn, wool, iron, &c. and the various productions of nature, wrought and altered into innumerable compositions, by the industry and ingenuity of man. The globe which we inhabit may be compared to a vast storhouse,

where an infinite variety of raw materials are laid up, ready for the exercise of invention and diligence. Few things in their natural state are adapted to our use, though scarcely the meanest is void of utility, when compounded with other substances, or transformed by the action of fire, or changed by chemical processes, or wrought by manual labour: a convincing proof that a life of sloth and inactivity is not suited to our nature, and that no rank, however exalted, is exempt from labour. The vegetable, mineral, and animal kingdoms, each furnish matter for us to work upon. You may remember that the clear, transparent, beautiful ware, we call glass, is formed only of sand and ashes; and you will presently be informed that the elegant manufacture of porcelain, or china ware, is composed of stones. Sophia, pleased with the account of tea, coffee, and chocolate, thought the tea-equipage would be completed by the description of the process used in making china, and in consequence has desired me to furnish her with information on the subject,

that she might be enabled to amuse you with the result.

AUGUSTA.

Stones! how is it possible to produce a thing so smooth, glossy, and delicate as China from them? and I am still more at a loss to conjecture how they can be formed into such a variety of shapes and figures, or by what means they can be united into such large flat surfaces, as dishes, bowls, &c.

SOPHIA.

By first grinding them into a very fine powder, and afterwards making them into a smooth paste.

HENRY.

Paste is soft and yielding, and will not retain its shape when handled.

SOPHIA.

It must be hardened by fire before it is in a condition for use.

CHARLES.

I have read that the Chinese, the inventors of this curious art, are extremely secret, and so jealous of the eye of strangers, that they

will not allow the Europeans to go beyond the suburbs of those cities where factories are established, lest they should discover the mysteries of their different manufactures.

MR. HARCOURT.

This is a just representation of them. They are equally unwilling to communicate knowledge or receive instruction; and if we except the traffic carried on with the different nations of Europe at Canton, they have scarcely any intercourse with the rest of the world. Missionaries from the society of the Jesuits have indeed been admitted even into Peking, their capital city, on account of their skill in astronomical knowledge, which recommended them to the notice of the Chinese emperors and grandees, though the object of their journey was the propagation of Christianity. Most of them being men of intelligence and learning, have bestowed attention on whatever they saw that was curious or useful; and some of them have been enabled to transmit their observations to Europe. From this source the most authentic information on the manufacture of porcelain

has been obtained, and was sent to the Grand Duke of Tuscany. But, Sophia, I do not intend to intrude upon your province. We expect our information from you.

SOPHIA.

It will give me great pleasure, if I am capable of affording any entertainment. The art of making porcelain is one of those in which the oriental nations have excelled the Europeans. It is chiefly manufactured in China, from whence it takes its name; but it is also brought into Europe from other parts of the East, particularly Japan, Siam, Surat, and Persia. Neither the inventor, nor the period of its invention, is known, the Chinese annals being silent on the subject.

MR. HARCOURT.

Although we must acknowledge that the Orientals are superior to us in this art, yet Europe has established manufactures for several years, that have produced wares but little inferior to those of our eastern masters. The first European porcelains are said to have been made in Saxony. France followed her exam-

ple ; then England ; afterwards Germany and Italy. Each of these manufactures differed from those of Japan and China, and respectively possess a distinct character of its own.

MR. HARCOURT.

Connoisseurs in porcelain have valued some of the produce of the manufacture of Meissen, a few miles from Dresden, the capital of Saxony, at even a higher rate than those of China, on account of the superior excellence of the painting and enamelling. The Saxons attribute the invention to an alchymist, named Betticher, who was confined in the castle of Koenigstein, by the king of Poland, on a suspicion that he was master of the secret of the philosopher's stone, which was supposed, by credulous persons, to possess the power of converting all metals into gold. Unable, with all his efforts, to obtain the object of his researches, he employed his leisure in more useful experiments, and discovered the means of making a ware, which, by its excellence and value, continues to enrich his country. His death happened in the year 1719. : Among

the French porcelains, that of the late king's manufactory, at Sevres, is the most esteemed. The Chelsea China is but little inferior to those of Saxony and France ; but being expensive, and adapted chiefly to ornamental purposes, is of no very general advantage. Of the other manufactories established in this country, that of Worcester is best suited to common use, as it wears well and comes cheap. Sophia has acquainted herself with the materials, and manner of manufacturing this commodity in the porcelain works in China, which will be sufficient to give us a general idea of the subject, without entering into the particulars of the manufactures of Europe, they being all formed upon one principle, however they may vary in minute differences.

SOPHIA.

M. Reaumur bestowed great pains in analysing the component parts of the eastern China, and found that it consisted of two substances, one of which is easily vitrified, or converted into glass ; the other possessing a contrary quality : the combination of those

opposite materials produces porcelain, which is a half-vitrified substance, or manufacture in a middle state, between the common baked earthen-ware of our coarse manufactures, and true glass. This composition makes a very curious article in commerce, and not less so in natural history. In order to proceed with method, I shall consider four things: the materials that compose it; the art of giving the proper figure and shape to the different works; the colours with which it is painted, gilded, and enamelled; and, lastly, the baking or exposing it to the proper degree of fire. There are two kinds of earth, and as many different oils, or varnishes, used in the composition of porcelain. The first earth, called kaolin, is intermixed with glittering corpuscles; the second, named petunse, is plain white, but exceedingly fine. They are both found in quarries twenty or thirty leagues from Kingteching, the name of the town where the most considerable China-works are carried on; and to this place these earths, or rather stones, are brought

brought in a number of little barks, incessantly passing up and down the river Iaotcheou for that purpose. The petunses are cut from the quarries in form of bricks, being naturally pieces of a very hard rock. Those are mostly valued of which the colour inclines to a greenish hue. The first preparation of those bricks is to break and pound them, till they are rendered impalpable, or as fine as can be conceived. This powder is thrown into an urn full of water, and stirred briskly about with an iron instrument. After letting it stand still a while, the lighter parts of the powder form a skin on the surface of the water, several inches thick, which the workmen carefully skim off into another vessel, filled with water, leaving the heavier sediment at the bottom to be reground. The second vessel is left to settle, and when it has stood long enough, they pour off the clear water, and reserve the matter which subsides for use. When it is nearly dry, it is cut into square pieces, and afterwards mixed with kaolin,

kaolin, in proper proportion. The kaolin is much softer than the petunse, when dug out of the quarry; yet this is the ingredient, which, by its mixture with the other, gives strength and firmness to the work. The mountains whence the kaolin is dug, are covered on the outside surface with a reddish earth. The mines are deep; and the matter is found in glebes or clods. They prepare both these stones in a similar manner.

CHARLES.

Pottery in general is made of clays or argillaceous earths, because they are capable of being kneaded, and easily receive any form, and acquire solidity and hardness, by exposure to the fire; but I observe that porcelain is formed of the hardest rocks, reduced to an artificial clay or paste, by grinding them fine, and softening them with liquids.

SOPHIA.

The oils that are added, soften them, I suppose, in a still greater degree, and render their texture smooth and uniform. The first oil or varnish is a whitish liquid substance,
drawn

drawn from the hard stone of which the petunses are formed. They chuse the whitest squares, and those that have the most streaks of green in them, for making the oil. They prepare the petunses for this purpose in the same manner as for making squares. When reduced to this state, it is mixed with a mineral stone, called shekau, or kehao, resembling alum, which they first beat red hot, and then reduce into an impalpable powder: this gives the oil a consistence; but it should not be made too thick, as it is still to be kept in a liquid state. The fourth ingredient is the oil of lime, which requires a more tedious and difficult process. After dissolving large pieces of quick lime, and reducing them to a powder, by sprinkling water on them, they put a layer of fern on this powder, and on the fern another of the slacked lime, and so on alternately, till they have heaped a moderate pile, to which they set fire. When the whole is consumed, they compose another pile of layers of the ashes, and new layers of dry fern, which they burn

as before. This operation is repeated five or six times, the oil being reckoned better, the oftener the ashes are burned. A quantity of these ashes of fern and lime is thrown into an urn filled with water, and to one hundred pounds of ashes is added one pound of shekau, which dissolves in it. The rest of the process is the same as in preparing the earth of the petunses. The sediment found at the bottom of the second urn, kept in a liquid state, is called the oil of lime, from which the porcelain derives its principal lustre.

CECILIA.

I am not surprised at the superiority of porcelain to common earthen-ware, now I am acquainted with the various processes used to prepare materials for the elegant purposes for which they are designed.

MRS. HARCOURT.

As you have described the materials of this manufacture, and the manner of preparing them for their several uses, we must be contented to reserve the account of the various methods

methods of forming them into vessels, figures, &c. till a future opportunity, as a particular engagement obliges me to leave you rather earlier than usual this evening.

CONVERSATION XIX.

AUGUSTA.

MY father has promised to take me to-morrow, to see a gentleman's museum, which is filled with rarities and valuable curiosities. Among other things, he tells me that there are several philosophical instruments, and that I am to see a variety of experiments. I should anticipate a great deal of pleasure in this visit, were I not entirely ignorant of the subjects with which I am to be entertained. So many things arise in my mind, which I wish to enquire about, lest I should expose my ignorance before strangers,
that

that I find it difficult to select the questions most necessary to ask.

MRS. HARCOURT.

A consciousness of our defects is the first step towards improvement. A young lady of your age is not expected to be deeply skilled in philosophy; much less to display her knowledge, should she possess a small share : but a general acquaintance with the uses of the most common philosophical instruments, is not only ornamental, but also a very useful accomplishment, and should form part of every liberal education.

AUGUSTA.

My father mentioned several particulars that are to be shown me; telescopes, microscopes, and an orrery especially : but I am quite unacquainted with the purposes to which any of them are applied.

MR. HARCOURT.

In order to prepare your mind for your intended visit, we will defer our conclusion of the porcelain manufacture till our next meeting, and endeavour to explain the uses to

which some of the most common philosophical instruments are applied. To enter into a description of their construction, or an explanation of their parts, would be uninteresting and tedious, unless we had the machines before us. We will begin with the telescope, as presenting the most conspicuous, important, and noble objects in nature. It is an optical instrument, consisting of several glasses or lenses, fitted into a tube, through which remote objects are viewed as if near. Before the invention of the telescope, the wonders of the heavens were concealed from us beyond the powers of the naked eye; and astronomy, that exalted science, which illustrates the omnipotence of the Divine Creator of the Universe more eminently than any other branch of human knowledge, has been improved, and brought, by this simple instrument, to a degree of perfection unthought of in former ages. The discovery was owing to chance rather than reflection, as it is certain that the theory upon which it depends was not known when the first telescopes were made. Several
claimed

claimed the honour of the invention; but Galileo, in the beginning of the seventeenth century, having been told of a certain optic glass made in Holland, which brought distant objects nearer to the eye, considered by what means this effect could be produced, and grinding two pieces of glass into form, as well as he could, fitted them to the ends of an organ-pipe, and with this indifferent apparatus showed at once the novelty and wonder of the invention to the Venetian noblesse, on the top of the tower of St. Mark. From this time Galileo devoted himself wholly to the improving and perfecting of the telescope, and by his perseverance deserved the honour, usually attributed to him, of being the inventor of the instrument, and of its receiving the denomination of Galileo's tube, from his name. The Doge of Venice rewarded his assiduity with the ducal letters, and doubled his salary.

MRS. HARCOURT.

The extraordinary talents of this great man improved the first invention of the telescope

to a vast degree of perfection ; but it has been reserved for the period in which we live to advance the magnifying powers to a height at once truly astonishing. Our cotemporary, Dr. Herschel, has made surprising progress in celestial geography, if I may be allowed the expression, by means of his Newtonian seven-foot reflector, the most powerful instrument of the kind ever seen. It has enabled him to discover many stars before unknown, and curious particulars relative to those with which we were previously acquainted.

CHARLES.

When the immense and inconceivable distances of the fixed stars are considered, it is wonderful to reflect that the inventive powers of such a diminutive animal as man, have ever attained to such degrees of information, on a subject apparently so far beyond his reach.

HENRY.

I do not think that the stars are so very far distant. On a clear night I have observed them but a little way above my head. I

have tried several times to count them, but they are so numerous that I have always found it impossible.

CHARLES.

You are much deceived, my dear brother, in both respects. The stars that are visible to the naked eye are not so numerous as we are apt to suppose, from viewing them in a confused, irregular manner. A thousand is supposed to be the greatest number ever seen in our hemisphere at one time, by the keenest eye and most attentive observer. Their extreme distance conceals them from our sight, except they are unveiled by the assistance of telescopes; for they are really numerous, beyond our limited imagination to conceive: and in order to give you a faint idea of their vast distance, I will relate a few observations that I have heard upon the subject. Nothing, that we know, is so swift in its passage as light. A ray of light passes from the sun to the earth in eight minutes and thirteen seconds, a distance of ninety-five millions one hundred and twenty-three thousand miles;



Mental Improvement.

and yet, though possessing this amazing velocity, it would be one year and a quarter traversing the space between us and the nearest fixed star. A cannon-ball, discharged from a twenty-four pounder with two-thirds of its weight of powder, moves at about the rate of nineteen miles in a minute, but would be seven hundred and sixty thousand years passing from the nearest fixed star to our earth. Sound, which travels at the rate of nearly thirteen miles in a minute, would be one million one hundred and twenty thousand years in passing through the same space.

CECILIA.

How far does the structure of the universe, viewed in this light, exceed the bounds of the strongest imagination! Well might David express his sense of those wonders, by exclaiming, that "the Heavens declare the glory of God, and the firmament sheweth his handy work."

SOPHIA.

Addison remarks, that the universe is the

work of infinite power, prompted by infinite goodness, having an infinite space to exert itself in; so that our imagination can set no limits to it.

MRS. HARCOURT.

The microscope is an instrument calculated to show the other extreme of nature's works, by magnifying very minute objects, so as to render that clear to the sight, which, from its minuteness, was before imperceptible. Dr. Hooke, who has written on the microscope, divides the objects proper to be viewed by it into three classes, which he calls exceeding small bodies, exceeding small pores, and exceeding small motions. Small bodies must either be the parts of larger bodies or things, the whole of which is too minute for our observation, unassisted by art; such as small seeds, insects, salts, sands, &c. Very small pores are the interstices between the solid parts of bodies, as in stones, timbers, minerals, shells, &c. or the mouths of minute vessels in vegetables; or the pores in the skin, bones, and other parts of animals. Extreme small motions

motions are the movements of the several parts or members of minute animals, or the motion of the fluids contained in either animal or vegetable bodies. Under one or other of these three heads almost every thing around us affords matter of observation, and may conduce to our amusement and instruction.

AUGUSTA.

From what I have heard this evening, I expect to be highly entertained to-morrow, and hope, on some future day, you will favour me with more information on these subjects.

MR. HARCOURT.

It always affords me peculiar pleasure to communicate any thing to you, my dear children, that may enlarge and exalt your ideas of the Great First Cause, from whom every thing proceeds, and by whom every thing is arranged and governed in the most perfect order: whether we reflect on the heavenly bodies, those stupendous instances of his omnipotence; or consider the insect, imperceptible by its minuteness, yet perfect in all

its parts, both internal and external, we are led equally to admire and adore the same power, wisdom, and goodness, that are manifested in each extreme of his works.

MRS. HARCOURT.

The order of the universe is an inexhaustible theme of wonder and admiration to all who consider it attentively. The wisest and most virtuous men of all ages have uniformly agreed in admiring the connexion of its parts, and the correspondence of means to the end designed. Of what use would the eye have been, with all its curious mechanism, if there had been no light to render objects visible? The more extensive our knowledge of nature, the more capable we are of tracing the wisdom and intelligence that are visible in every part of the creation.

CHARLES.

Notwithstanding the harmony of the works of Providence is so obvious to the most superficial observer, I have heard that there have been men so perversely stupid, as to suppose that this beautiful world, with all its various

inhabitants, as well as the other parts of the universe, were produced by mere chance, or the accidental assemblage of atoms, and have refused to acknowledge the existence of one Supreme Intelligent Being.

MRS. HARCOURT.

If any man indeed ever doubted of that awful truth, he must have first bewildered his mind in useless and unprofitable speculations on metaphysical and abstruse subjects, beyond our limited capacities to explore, and ill suited to make us either wiser or better.

SOPHIA.

Let such a one observe the texture of the simplest blade of grass, the gauze wing of a common fly, without extending his researches to the economy of either the animal or vegetable world, and try if it can be imitated by the most exquisite specimens of art. He will find that it baffles every attempt, even in its external structure; but when he examines the internal organization and uses of the parts, he must acknowledge it to be the work of a Divine Artist.

MR. HARCOURT.

The various degrees of instinct in animals, and the intellectual powers in man, will be still more difficult to account for, as originating from any inferior cause than that of an Infinitely Wise Almighty Being.

MRS. HARCOURT.

Natural religion, or the belief of the existence of a God, the Creator and Preserver of the Universe, (for the manifestation of his power, wisdom, and goodness, is not confined to the globe which we inhabit, but extends to the remotest point of created space,) is so congenial to our rational nature, that it is surprising that any one ever dared to acknowledge a doubt of it.

MR. HARCOURT.

The united testimony of all ages and nations concurs to render such men suspected of professing a belief, which in the privacy of their own minds they deny; or of wilfully refusing to open their understandings to the convictions of truth. The most savage and ignorant tribes in every part of the globe, not only acknowledge

ledge the existence of a Supreme Cause, (though they worship him under different names, and frequently mistake very absurd objects for his representatives,) but also a universal belief of his divine influence upon the human mind. From this conviction arises the idea of prayer, a custom confined to no particular country, but the universal refuge of the human species in moments of distress and anguish. An assurance that he graciously condescends to hear the petitions of his creatures, and benevolently relieves their affliction, must give encouragement to these applications.

MRS. HARCOURT.

If we deprive mankind of this consoling hope, our present state is a deplorable one indeed. Beset with temptations, surrounded by difficulties and trials, to what power could we flee for succour?—Wretchedness, with despair, would be thy portion, O man! bereft of the consolation of natural religion, which not only teaches us to believe in the existence of an Almighty God, but also to

adore his infinite perfections ; to rely upon his goodness for preservation from the evils of the present life ; and prepares us for the reception of the truths of revealed religion : by which are meant, those manifestations which have been revealed to man supernaturally by various means, but in a most especial manner by the coming of Jesus Christ, who was sent on earth to introduce a more pure and holy religion than that given to the Jews, or any that had ever been contrived by human wisdom. He might properly be called the messenger of glad tidings, offering peace and immortality to all the human race, without distinction, who should embrace his doctrine, and live according to his precepts.

MR. HARCOURT.

The perverseness of men's dispositions, and the limited faculties we possess, whilst in our present state, will ever raise cavillers against the most clear conviction : but let us shut our ears against their conversation, and our eyes against their writings ; contenting ourselves with the study of the New Testament, and

relying upon the assurances the Gospel offers : convinced that this line of conduct cannot injure us, but is likely to lead us to peace and happiness.

MRS. HARCOURT.

The period of man's life is too short to be wasted in speculative researches, which have no influence in correcting the disposition or amending the heart. The path of duty is plain and obvious to every one who sincerely endeavours to find it, and is equally adapted to the capacity of the unlettered hind, as to that of the learned philosopher. Each one has a part to perform, according to the circumstances in which he is placed. Superior intelligence calls for superior excellence. A disposition to acknowledge the goodness of the Supreme Being towards all the parts of his creation, and thanksgiving for all the peculiar blessings bestowed on each individual, are incumbent duties on every rational creature. Let us unite in offering this incense with unfeigned gratitude, and conclude this conversation in the words of the poet :

Almighty Power, amazing are thy ways,
Above our knowledge, and above our praise;
How all thy works thy excellence display!
How fair, how great, how wonderful are they!
Thy hand yon wide extended heaven uprais'd,
Yon wide extended heaven with stars emblaz'd,
When each bright orb, since Time his course begun,
Has roll'd a mighty world, or shan'd a sun.
Stupendous thought! how sinks all human race,
A point, an atom, in the field of space.
Yet e'en to us, O Lord, thy care extends,
Thy bounty feeds us, and thy pow'r defends.
Yet e'en to us, as delegate of thee,
Thou giv'st dominion over land and sea.
Whate'er on earth, or flits in air,
Whate'er of life the watery regions bear,
All these are ours, and for the extensive claim,
We owe due homage to thy sacred name.
Almighty Power, how wondrous are thy ways!
How far above our knowledge and our praise!

CONVERSATION XX.**MRS. HARCOURT.**

SOPHIA, the company has a claim upon you for the completion of your account of the porcelain manufacture, which was deferred, for the sake of obliging Augusta with some information concerning the use of philosophical instruments. You have already amused us with a description of the materials; we are impatient to be informed of the manner of making them into porcelain.

SOPHIA.

The proportion of petunse and kaolin varies according to the degree of delicacy of the texture of the ware required to be made. The best kinds demand a greater quantity of kaolin than the coarser sorts. Kneading and tewing the two earths together is the most laborious part of the work, which operation

is performed in large basons or pits, well paved and cemented, in which the workmen trample the materials with their feet, till the mass is well incorporated, and becomes of a consistence requisite for the use of the potter. When taken out of the basons, they are obliged to knead it with their hands, after having divided it into smaller pieces. On this operation the perfection of the work depends, as the intervention of the smallest body, or the minutest vacuity, would be sufficient to spoil the whole: a grain of sand, or a single hair, will sometimes cause the porcelain to crack, splinter, run, or warp.

CLELIA.

What extreme nicety is requisite in the workmen, to attend to such small circumstances!

MR. HARCOURT.

Excellence in every art is attainable only by attention and accuracy.

SOPHIA.

The different form of the vessel is effected by a turning wheel, as in our potteries; but

moulds are used in the formation of figures of men or animals: ornaments in relievo are also formed in moulds, and finished with the chisel. This part of the work partakes more of the nature of sculpture than mere pottery; therefore several other instruments, proper to dig, smooth, polish, and touch up the strokes that escape the mould, are necessary to give the piece its utmost perfection. Pieces in relievo, such as flowers, &c. are frequently formed first, and then added to the figure they are designed to ornament, by cementing them with porcelain earth, moistened with water, and the fissure is polished with an iron spatula.

CHARLES.

Of what material do they make the moulds for this purpose?

SOPHIA.

They are made of a yellow fat earth, which is kneaded till it be sufficiently dry, fine, and mellow, to be formed into the necessary shapes.

MRS. HARCOURT.

In the arts of design and perspective, the Chinese are exceedingly deficient, and must therefore yield the palm undisputed to the Europeans in these respects; as the finest tints, laid on without taste or judgment, can only produce a glaring effect upon the eye, but are insufficient to please a correct fancy. In the brilliancy of their colours they excel us; but whether this arises from the materials they use, the superiority of their varnish, or their method of burning them, I cannot decide.

SOPHIA.

The colours applied to porcelain are the same as those used in enamel painting, and consist of metallic calces, which are the residue of metals, after calcination by fire, or solution by chemical processes. With design to form colours for painting on china or enamel, they bruise these calces, and incorporate them with a very fusible glass. Crocus of iron affords a red colour; Cassius's precipitate of gold makes the purple and violet; copper cal-

ened by acids, and precipitated by an alkali, gives a fine green; zaffre makes the blue; earths slightly ferruginous produce a yellow; and lastly, brown and black colours are effected by calcined iron, mixed with a deep blue zaffre. These colours are ground with gum-water, or oil of spike, to render them fit for use. I am indebted to my mother for all that I have related concerning the colours, and I hope I have repeated it without mistake. A powder or calx of gold is applied, as in the coloured enamels, for the gilding. The painted and gilded porcelains are exposed to a fire capable of fusing the glass, with which the metallic colours are mixed: by this means they adhere, and acquire a gloss equal to that of the glazing of the china. The gold receives additional brightness from burnishing it with a blood-stone.

HENRY.

Pray, sister, explain what a blood-stone is.

SOPHIA.

It is a ruddy mineral substance, brought

from Egypt and Ethiopia, and named from its resemblance to dry curdled blood.

AUGUSTA.

I have often heard that poor women suffer great hardships from want of employment, especially those who have been decently brought up. Might not painting on china be suitable work for them, as it depends more upon taste than strength.

MRS. HARCOURT.

Were there more opportunities of obtaining a creditable subsistence, it would preserve many unhappy females in the path of honour and virtue, who now wander, forlorn and abandoned, in the ways of vice. Too many of those occupations that are adapted to the abilities of women, are engaged by men, whose talents and bodily strength might be more properly exerted in laborious callings.

MR. HARCOURT.

You are pronouncing a satire upon your sex. Whilst ladies of fashion patronise men-milliners, stay-makers, mantua-makers, hair-dressers, and haberdashers, without manifest-

ing the smallest compassion or sympathy for their forlorn and destitute sisters, it cannot be matter of astonishment that the industrious female vainly seeks employment, and is deprived of those resources to which she has a natural claim.

CHARLES.

A lady of rank and influence, who would counteract this pernicious mode, by openly encouraging women, in the different branches of trade suitable to their powers, would deserve the imitation of her countrywomen, and the honourable appellation of a true patriot.

CECILIA.

When I grow up, I will always employ women to make every article of my dress.

AUGUSTA.

And I will frequent those shops only where the customers are served by women.

MR. HARCOURT.

This conduct will do honour to your understandings, as well as to your hearts. But we have wandered far from the subject in hand. Sophia, resume your account.

SOPHIA.

The last operation before the porcelain is carried to the oven, is the oiling or varnishing. According to the quality of the work, the varnish is laid on more or less thick, and seldomer or oftener repeated. Much art is required in putting it on: all parts of the vessel should be equally covered, and no spot thicker than the rest, which would destroy the smoothness and polish of the surface. Two kinds of ovens are used in baking china; large ones for works that are baked only once, and smaller ones for those that require a double baking. The ovens are composed of a mixture of three different sorts of earth. At the top of the dome, which is in the form of a tunnel, is a large aperture, to give vent to the flames and smoke, mounting up continually, as soon as the oven is once lighted. The pieces of porcelain that are baked in the large ovens, are put into cases or coffins, as they are called, made of the same materials as the ovens, to prevent any diminution of lustre, from the too violent effect of a naked fire.

Great

Great caution is necessary in placing the pieces of porcelain in the smaller ovens, no cases being used: they are piled up pyramidically, so that no part of that which is painted in one touches the paint in another, lest the colours should run, and destroy the beauty of the whole.

MR. HARCOURT.

The workhouses are, properly, vast yards, walled round, with sheds and conveniences for the defence of the workmen against the weather, as well as other buildings adapted to provide them with dwellings. This manufacture, like several others that have passed under our observation, employs a prodigious number of hands. Almost every piece is handled by twenty workmen, before it is ready for the painter, and by more than sixty before it attains perfection. The painting work is distributed amongst a great number of artists in the same laboratory. One paints nothing but borders; another traces out flowers, and gives them to one of his fellow-labourers to lay on the shades; waters
and

and mountains alone employ a fourth hand; birds and other animals a fifth; whilst the human figure is reserved for the work of a particular person. There are porcelains made of all colours, both with respect to the grounds and the representations upon them. Some are simple, consisting of one colour, as blue; others composed of a variety of tints; and others again are heightened with gold. This multiplicity of workmen is found, by experience, to forward, rather than retard the work, not only in this, but in all manufactures where various operations are necessary. Each workman, by continual application to the same object, acquires dexterity and facility in that branch of the art, and not only performs his part more expeditiously, but better, by frequent repetition.

CHARLES.

How few accommodations can a man possess who lives in a state of solitude! He must be totally incapable of bringing any thing to perfection, much more the numberless conve-

niences required to render civilized life comfortable.

MRS. HARCOURT.

Perhaps it is impossible for a man to subsist, any considerable time, entirely independent of his fellow creatures; those who approach the nearest it, afford specimens of the wretched effects of the want of society; and those interests that are connected with it: indolence and ignorance mark their characters, and the superiority of intellectual capacity is sunk into the sensual wants of the brute. The principal objects that occupy the mind of a mere savage, are, to provide food for present subsistence; and when he has satiated his appetite with his precarious meal, to lie down free from apprehension for the wants of the morrow.

MRS. HARCOURT. .

The blessings that result from the mutual assistance we receive from others, and give in return, should teach us humility and kindness to every one; remembering, that the proudest and the greatest would be destitute and wretched,

ed, without the good offices of many of the meanest of mankind.

AUGUSTA.

I blush at recollecting the contempt with which I formerly treated those whom I considered as my inferiors. I owe my change of sentiment and behaviour to the instruction I have received from our evening lectures, which have taught me to know, that every worthy individual is valuable to the community.

SOPHIA.

The formation of a common tea-cup engages a great many hands, as you will perceive, when I have related the particulars. The potter, who has the management of the wheel, gives the cup its form, height, and diameter. A second workman fits it to its base. A third receives it from him, and applies it to a mould, to bring it to its true form. A fourth polishes the cup with a chisel, especially about the edges, and reduces it to the proper thinness. Another workman turns it upon a mould, to smooth its inside; the han-

dles, or ornaments in relieve, are added by different hands ; and lastly, the foot is rounded and hollowed on the inside with a chisel, by a workman whose peculiar office it is. When arrived at this degree of maturity, it has still many operations to undergo, which require the skill of various artists. It must yet be painted, varnished, baked, and glazed.

HENRY.

The trouble that it costs to make a tea-cup will teach me to be careful how I break one.

CECILIA.

Fire does not crack all kinds of earthenware. Mrs. Hervey has a set of saucepans made of a peculiar kind ; and, what is still more extraordinary, a stove of the same substance.

MR. HARCOURT.

The manufacture you speak of is carried on at Chelsea. When we are in London, an afternoon might be pleasantly passed in observing the works. It shall be one of our first excursions.

MRS.

MRS. HARCOURT.

Before this subject is dismissed, allow me to pay a just tribute of praise to the abilities and taste of our late countryman, Mr. Wedgwood, who has extended and encouraged the manufacture of stone-ware to a vast variety of curious compositions, subservient not only to the common purposes of life, but also to the arts, antiquities, history, &c. The utility and elegance of his inventions have diminished the use of foreign china, and substituted in its stead a ware that supplies the domestic wants of our own country; and by its excellence and cheapness, is in general esteem in most of the nations of Europe.

AUGUSTA.

Does not enamel resemble china?

MR. HARCOURT.

Charles, it is not long since we went together to Mr. Spencer's, the jeweller, to see some pieces of clock-work that were to be sent to the East-Indies; if you can recollect what passed on the composition of enamel, it

will form an agreeable sequel to Sophia's information.

CHARLES.

A mixture of glass, with metallic calces, composes the substance called enamel. The general basis of the different kinds consists of an equal proportion of the finest lead and tin calcined, or burned together in a kiln, and then sifted to a powder, which is boiled in several waters, pouring off the water carefully each time. This operation is repeated as long as any part of the calx passes off with the water; the remainder is calcined again, and washed in the same manner as before. After evaporating the different waters which have been poured off from the calces, a powder of extreme fineness remains; this, with an equal quantity of crystal frit, and a small proportion of white salt of tartar, when powdered, sifted, and well mixed together, is once more exposed to the operation of fire for some hours, and being again reduced to powder, forms the material of common plain enamel, of which all others are made.

CECILIA.

CECILIA.

We shall not be satisfied, without you tell us in what manner it is applied, to compose the beautifully coloured enamels.

CHARLES.

Enamels are of three kinds. The first kind is intended to imitate precious stones; the second is used in painting in enamel; and the third by enamellers, jewellers, and goldsmiths, on gold, silver, and other metals. The colours require to be very nicely ground, and mixed well together, adding a proper quantity of the matter of plain enamel. This mixture, when incorporated into one mass by the heat of a furnace, is cast into water to cool; after it is dried, it is again melted in a furnace. In this state it is usual to dry the colour, which, if too strong, is weakened by adding more of the plain matter; or, if requisite, heightened, by increasing the quantity of the coloured ingredient.

HENRY.

Are enamels made mostly in England?

MR.

MR. HARCOURT.

The two first kinds are frequently made by the artists who apply them to their respective uses; but the last comes chiefly from Venice and Holland, in the form of little thin cakes, of different sizes, impressed with the maker's name, or some device adopted by him, as the sun, &c. Those imported from Venice are mostly white, slate-colour, sky-blue, carnation, yellow, green, and a deep blue: from these seven colours, the ingenuity of those skilled in this art forms the various tints that please the eye, in the rich workmanship that adorns our shops of jewellery. Of all these, the simple white is of the most general use: by uniting it with azure, it becomes slate-colour; the addition of copper and Cyprus vitriol makes it a sky-blue; that of Perigeux, a flesh colour; iron rust renders it yellow; and copper filings change it to green.

SOPHIA.

The Dutch owe the excellence of the glazing of their porcelain to the use of this plain enamel.

CECILIA.

CECILIA.

My love of drawing makes me desirous of knowing the method of painting in enamel.

MR. HARCOURT.

Charles, I call upon you to repeat what you heard upon that subject, as I doubt not that you remember it, as well as that which relates to enamel in general.

CHARLES.

The purest gold is the best substance to work upon, because it receives all colours, and admits equally of those that are transparent or opaque: other metals are sometimes used, but they are adapted only to particular colours, or modes of laying them on. The invention of opaque or thick colours is of a much later date, and is an improvement upon the transparent method: this discovery has produced many exquisite pieces of modern art, presenting portraits and events from history in as great perfection as the best paintings in oil; but with this important advantage, that they preserve their beauty and
lustre

lustre undiminished by the injuries of either time or weather. Before the colours are laid on, the gold plate should be covered with plain white enamel on both sides, to prevent any swelling or warping from the fire; it also serves the purpose of heightening the light tints, being left clear in those parts that require it. The plate being thus prepared, the outline is to be sketched upon it, according to the design of the piece, and placed before a fire, which is to be repeated every time the work is retouched.

CECILIA.

Is the common fire hot enough to give the colours a gloss ?

CHARLES.

I ought to have said a reverberatory fire which is made in a little furnace, in which the heat is confined all round the place where the piece is put. The colours, after being mixed up with oil of spike, are laid on, with great dexterity, with the tip or point of a hair pencil, as in miniature painting.

MRS.

MRS. HARCOURT.

In the transparent manner, the colours are laid on flat, and mixed with water only. Although we owe the improvement of this art, in its present state of perfection, to the moderns, the original invention of giving colours to glass, upon which the system of enamel painting is founded, is extremely ancient. I think we read of beautiful vases, curiously enamelled with figures, being made in Tuscany, whilst Porsenna was king of that country. A later period produced many admirable specimens of the same discovery in the duchy of Urbino, enriched by the inimitable pencil of Raphael, which are still to be seen in the cabinets of the patrons of the fine arts, under the name of Raphael's ware.

MR. HARCOURT.

The French claim the honour of having raised the art to its present height: in the year 1632, James Tantin, a goldsmith of Chateaudun, first discovered the method of using opaque colours, which preserved their lustre, after being exposed to a degree of heat sufficient

sufficient to melt them, without running one into another. Many of his countrymen improved upon his labours, till the art extended to other nations. The value of the precious metal to which it is applied, confines its use principally to miniatures, snuff-boxes, rings, watch-cases, &c.

AUGUSTA.

I have a fine miniature of my mother, which is thought a great resemblance: will you please to look at it, and tell me whether it is painted in enamel?

MRS. HARCOURT.

It bears a strong likeness to the features of my beloved friend, and recalls many tender emotions to my mind; but it is painted in the common manner, with water-colours on ivory.

CECILIA.

Are miniatures always painted either in enamel or on ivory?

MRS. HARCOURT.

Sometimes they are done upon vellum, or even paper; but it is necessary to strengthen the
the

the paper with isinglass size, thickened with pearl white. A coat of starch, of moderate thickness, with a little isinglass infused in it, is useful to render common paper more capable of bearing the colours. It should be laid on very smoothly with a brush, and when the paper is almost dry, it should be pressed between boards. Two sheets of paper, cemented together with this mixture, make a suitable substance for this species of painting, which consists of dots or fine strokes of the pencil. It is an elegant art, and well adapted to vary the amusements of young women who have leisure and taste to pursue it. The capacity of representing a lively image of a flower or a bird, may be ranked amongst the higher accomplishments; but the power of delineating the human countenance is very much superior to it; particularly that branch of design which enables the artist to convey to the ivory or canvass the resemblance of an individual endeared by friendship. My dear girls, you have already attained a tolerable degree of excellence in the use of the pencil :

it will be easy for you to rise higher, and adorn my closet with the likenesses of those friends that are dearest to us.

SOPHIA.

It will give me great pleasure to learn to paint miniatures; and I have no doubt ~~that~~ it will be equally agreeable to Augusta and my sister. The last time you indulged us with visiting Mr. Wedgwood's warehouses, I remember to have observed some vases of black porcelain, painted after antique designs, but without any glazing; I am at a loss to know how this difference arose.

MRS. HARCOURT.

The ingenious and indefatigable Mr. Wedgwood, ever desirous of improving the different branches of porcelain to their utmost perfection, after many experiments, and much reflection, invented a set of encaustic colours, that imitated the Etruscan vases, having beauty and durability without the defect of a varnished or glassy surface. The encaustic paintings of the ancients were done in wax, and afterwards melted before a fire. The vases

you remarked were painted in this revived method.

CHARLES.

I admire the genius and talents of Mr. Wedgwood, and think he has rendered more essential service to his country than some of the warriors whose tombs are in Westminster Abbey.

MR. HARCOURT.

He was indeed a useful member of the community, and at the same time that he improved the manufactures of his country, he enriched himself. But remark, that it was not by idle indulgence, or inattentive levity, that he attained these advantages : industry, perseverance, and talents, united to form his character, which may fairly be held forth for imitation.

HENRY.

To what uses did the ancients apply vases ? In our days they only serve for ornaments, or to hold flowers.

MR. HARCOURT.

They were used in their sacrifices, to hold

the incense. After burning the dead bodies of their relations, they deposited the ashes in an urn, which is a vase of a lower, flatter form, than those applied to other purposes. Before long we will repeat our visit to Mr. Wedgwood's warehouses. The collection of ornamental works affords a curious example of the various vessels in use in former ages; and whilst they increase our knowledge of the customs and domestic manners of the ancients, they contribute to establish a taste for that which is truly beautiful and elegant.

CHARLES.

I have heard that, of late, a great deal of our common china-ware has been printed with copper-plates, and that this method is far more expeditious than painting it. Before we separate, give me leave, father, to remind you of your promise of taking me to see the decoy-ponds to-morrow.

MR. HARCOURT.

I am glad you mentioned it. In the multiplicity of my concerns it might have passed
my

my memory. It is now time to retire, that we may be disposed to rise early, and pursue our walk in good time.

CONVERSATION XXI.

CECILIA.

THE only amends you can make, Charles, for depriving us of my father's company to-day, is by telling us what you saw at the decoy-ponds.

CHARLES.

The account will afford you so much diversion, that I do not fear being forgiven, for the sake of the entertainment our walk will produce.

MR. HARCOURT.

I am much pleased that we went, as the information we gained there will supply a subject for this evening, that, I believe, will a

least have the charm of novelty to recommend it to all the company.

AUGUSTA.

I do not even know their use or design.

MR. HARCOURT.

Decoys consist of different contrivances to ensnare wild-fowl of various kinds, especially dun-birds, widgeon, and teal. The first thing to be considered is situation. The pond, or piece of standing water, should be large, and sheltered upon all sides by woods, beyond which a marsh or uncultivated heath is desirable, for the purpose of preserving the water in the most profound stillness; for the accidental noises of a village or a high road would disturb the wild-fowl, and drive them from their haunts, to which they retire for the convenience of sleeping, during the day-time, in quiet and security.

SOPHIA.

I thought it had been peculiar to owls to sleep in the day.

MRS. HARCOURT.

That depends upon the habits of animals.

Most

Most of the ferocious kinds are said to repose in the day, and prowl in search of prey under cover of the night. Wild-fowl, after satiating themselves with food of an evening, retire to some piece of standing water, where they lie in multitudes, covering its surface, and resting themselves in a dozing state till the return of the same hour the next night, when they rise in such vast numbers as to occasion a pleasing melancholy sound, which may be heard at a very great distance on a still evening.

CHARLES.

The decoy-men call a flight or rising a hush; in Somersetshire they give it the appellation of a rodding. The ducks take their flight in a very curious manner, and with such order as to lead to a supposition that they are either under the command of a leader, or have previously agreed upon the disposition of their company. The whole body divides into two wings, leaving a space for those which are behind to follow with greater facility; above all, they are cautious to rise exactly against the wind.

HENRY.

HENRY.

Do they catch wild-fowl at all seasons?

MR. HARCOURT.

They are generally taken from October to February. It is forbidden by act of parliament to catch them in this manner from the 1st of June to the 1st of October. On the approach of winter they migrate from more northern countries into our milder climate, where the cold is seldom so intense as to freeze rivers and large pieces of water for any great space of time. The return of warm weather urges them to avoid the excess of heat, by retreating again to their former habitation.

HENRY.

How are they instructed to know the proper time for undertaking their journey, and by what means do they find their way over the vast ocean?

MRS. HARCOURT.

The All-wise Creator, when he formed the various tribes of animals, endued them with propensities adapted to their different natures, and bestowed upon each that power, or capacity,

city; of pursuing the best means of preservation, which we call instinct. The influence of this quality is universal amongst every order of living creatures inferior to man: from the mighty elephant to the most minute insect, its principle is uniform, producing a similarity of action in every individual of the same species. Whole flocks of birds are known to migrate from one country to another, in search of peculiar kinds of food, or induced by a transition of climate more congenial to their existence; but the most acute philosopher is unable to explain the sensation that teaches them the proper moment to remove, or the course that leads to the exact spot that produces the food they are seeking. Although we cannot account for the many curious facts which result from animal instinct, it is a subject which deserves our most attentive observation, supplying a never-failing source of amusement, and leading the mind to acknowledge and adore the wisdom of the Supreme Being, manifested in his works,

MR. HARCOURT.

Animals lose a part of the instinct they enjoy in a state of nature, by associating with man, and relying upon him for support and protection. In many instances they show a capacity of being taught, and acquiring artificial habits. The decoy-ducks are trained to allure and seduce others into the nets prepared for their destruction.

SOPHIA.

Surprising! by what art is this effect produced?

MR. HARCOURT.

It will be best explained when the apparatus belonging to a decoy-pond is fully described, a task which I impose upon Charles.

CHARLES.

A piece of water, of several acres, situated in the midst of retired woods, being chosen, a number of pipes, as they are called, are formed to catch the wild-fowl. These pipes consist of a ditch, or small canal, communicating with the pond, and growing narrower from the entrance to the termination; over
which

which is an arch of netting suspended upon hoops, closing at the end of the canal in a funnel net. As the direction of the wild-fowl depends upon the wind, a pipe is provided for almost every point of the compass. Along each pipe are placed, at certain distances, screens made of reeds, fixed in an oblique direction, so as to completely conceal the decoy-man from the wild-fowl; though he contrives to peep at them through small holes cut in the screens, over which he throws hemp-seed to the decoy-ducks, in order to entice them to the further part of the pipe: the hemp-seed being very light, floats upon the surface of the water, and allures the wild-fowl to follow their insidious companions into the snare. The decoy-ducks will frequently lead the way up the pipe at the sound of their master's whistle, and will sometimes dive under water; whilst the unwary strangers fly about, and are taken in the snare. The decoy-man is often obliged to make use of a little dog, when the wild-fowl happen to be in such a sleepy, dozing state that they will not follow
his

his ducks. The dog, having been long trained to the employment, plays backward and forward between the reed-screens, till he attracts the attention of the wild-fowl. Provoked at the disturbance, they advance without fear, to drive away this contemptible enemy; whilst the dog, by the command of his master, draws nearer and nearer to the end of the pipe, seducing his pursuers so far, that their return is prevented by the appearance of the fowler, who comes out from his hiding-place: nor will the nets above them suffer their escape upwards; pressed upon all sides, they rush into the purse-net and meet their fate. If the dog does not obtain a sufficient degree of attention, he is decorated with a red handkerchief, or something very showy, which generally answers the purpose.

MR. HARCOURT.

The men who are employed in this occupation find it necessary to be extremely clean in their persons, and change their linen before they attend their ponds, lest the effluvia of their bodies should discover them; these water-fowl
having

having such an exquisite sense of smelling as requires the utmost caution to elude it. For the same reason, the decoy-man takes his stand always upon that side of the pipe towards which the wind blows: or, as the sailors would express it, upon the leeward side.

AUGUSTA.

I suppose the dog may be taught almost any thing. The tricks of the dancing dogs have frequently amused me, and raised my astonishment by their dexterity. My own little Daphne has wonderful sagacity; she understands me whenever I speak to her, and begs so prettily when she wants a piece of gingerbread, that I trifle away many an hour in playing with her.

MRS. HARCOURT.

Time is too precious to be lavished in trifles. Minutes are sufficient to bestow upon such a useless employment; but I forbear to be severe in my remarks upon this honest confession, believing that you daily improve in the appropriation of your leisure. The facility with which dogs receive instruction is

wonderful, and renders them very beneficial to man, by enabling him to train them properly to the pursuit of many wild creatures, which he could never obtain without their aid. The dominion given to us over the inferior orders of animals, authorises us to avail ourselves of the faculties they possess, that they may become more useful: but the abuse of that power degenerates into tyranny, when we torment them unnecessarily. You admire the grotesque attitudes and ready obedience of those poor beasts which are led about, and compelled to amuse the unthinking spectators; but you would commiserate their sufferings, did you know the cruel discipline they have groaned under for the purpose of attaining these ridiculous accomplishments. A person of reflection and humanity ought to discourage the tormenting of an inoffensive horse, a harmless pig, or an innocent dog, when there is no other motive for it but the gratification of seeing either of them pick out the letters that are called for, paw the number of the hour, or dance a hornpipe. They receive
their

their lessons when very young, and they are enforced by the deprivation of food, and the influence of the rod placed in the hands of an unfeeling master.

AUGUSTA.

Cruelty is a vice to which I feel no temptation. I shall never take pleasure again in seeing extraordinary feats performed by animals, which I shall suppose to have been learned at the expence of their ease and comfort.

MR. HARCOURT.

The dun-birds are frequently taken in a different manner. It is usual for these birds to rise in vast numbers of an evening, after having reposed upon the water all day. The decoy-man, acquainted with the time of their taking wing, watches the proper moment, and draws a very wide net across the pond, which is supported by poles of fifty feet high; the leaders in the flight, impeded in their progress by the entanglement of the nets, fall back, and obstruct the passage of those that follow them; whilst they, in their turn, do the

M 2

same

same to those behind them. Confusion ensues; and being heavy, and unable to rise again, when once beaten down, they become an easy prey to the men, who stand on the back of the pond, prepared to take and destroy them. Their number contributes to their destruction. Seventy dozen have been taken by this means in one night. The produce of a season is almost beyond calculation.

CECILIA.

Is this what Mr. Chadwick meant, when he spoke of driving wild-fowl in the fens of Lincolnshire?

MR. HARCOURT.

That is practised only in the months of July and August, during the moulting season, whilst the birds are deprived of their wing feathers, which deprives them from escaping from the spaniel, which is well trained to the employment. The nets are set in creeks or narrow places, and the wild-fowl being put up by the dog, and unable to fly from him, are driven immediately into them; or sometimes the dog seizes them, and brings them

them unhurt to the feet of his master. They are taken alive, and yield considerable profit to the poor inhabitants of fenny countries. Though, at the time, they are lean and out of flesh, they presently become fat, and well-tasted, by feeding upon liver, barley, scalded bran, &c. and are then thought by epicures to have a higher flavour than either tame ducks, bred in a farm-yard, or wild ones in their natural state.

SOPHIA.

Has the dun-bird any resemblance to the common wild-Jack?

MRS. HARCOURT.

The bird known by that name is the *ferina-pochard*, called by Ray the red-headed wid-geon. It has a lead-coloured bill: the head and neck are of a bright grey colour: the breast, and part of the back, where it joins the neck, are black: the tail consists of twelve short feathers, of a deep grey: the legs are lead-coloured, and the inside of them a bright yellow, tinged with red. The head of the female is of a pale reddish brown. In the winter
season

season they frequent our fens, and augment the number of delicacies found in the London markets, forming an article of commerce that enriches three descriptions of persons. The decoy owner consigns them, in considerable numbers, to a wholesale trader, who retails them to the poulterers for the accommodation of his customers. During the course of the winter, especially if it prove severe, they advance pretty far to the south, being found in the neighbourhood of Grand Cairo, in Egypt. They migrate into France towards the end of October, in small flocks, from twenty to forty, and are also seen in the winter at Carolina. Their flight is rapid and strong, adapted to such long journeys; but the flocks form no regular shape in flying, and they chiefly live upon small fish and shells.

CECILIA.

The benefit arising from the wild-fowl that frequent fenny countries, must tend to counterbalance the many disadvantages of living in such swampy places, where neither corn nor
fruits

fruits can be expected to repay the labour of the peasant.

SOPHIA.

'Have you forgotten that every country is favoured with its peculiar treasure; that even Greenland is possessed of riches peculiar to its climate and situation ?

CHARLES.

One considerable source of support to the inhabitants of fens, is the profit produced by the multitudes of tame geese that are reared there. Mr. Chadwick says, that one person will possess one thousand breeding geese, from each of which he may depend upon bringing up seven young ones. Thus his stock will be increased to eight thousand by the end of the season.

MR. HARCOURT.

The possessors of these flocks do not rely only upon the demand for the use of the table, but upon the feathers, for their principal gain. Vast numbers, however, are sent annually to London, under the care of drovers, for the supply of the markets. The superannuated
geese

geese and ganders are got rid of by mixing them with the others: but, as their flesh is exceedingly tough and rancid, it cannot be supposed that the purchasers of these ancestors of so many descendants will be well satisfied with their bargain. They have recourse to the barbarous method of plucking, in order to obtain the feathers, and this operation is performed five times in the year. About the latter end of March they are plucked for feathers and quills; and they undergo the same discipline four times between that period and the latter end of September, for feathers only.

HENRY.

Does plucking the geese in this manner give them much pain?

MR. HARCOURT.

The noise and resistance made by the young ones, upon this occasion, show that the sensation is disagreeable; whilst the patient submission of those who have frequently suffered it, proves that it is not exquisitely painful. The cruelty of the custom does not consist
only

only in giving present uneasiness; but by depriving these poor creatures of their natural defence against the cold: numbers of them perish in consequence of it, if severe weather ensue.

CHARITY.

You will be surprised to hear of the care that is taken of the tame geese in the fens of Lincolnshire, during the breeding season. The owner of them prepares coarse wicker pens, made of the ozers which abound in those marshy situations, and places three rows of them, in tiers, one above another, in every apartment of his house. In these pens the geese sit and hatch their broods; each bird keeping possession of its own nest, without interfering with that of another. They are regularly, every morning and evening, driven to water, by a person called a gozzard, which signifies gooseherd, whose office it is to watch them, and, at their return, to replace those geese who occupy the upper stories in their proper lodges.

SOPHIA.

Does the tame and the wild goose belong to the same species ?

MR. HARCOURT.

They were originally the same. The influence of domestication alone has caused the tame ones to differ from the parent stock. The grey lag, or wild goose, is two feet nine inches in length, and five feet in extent. The bill is large and elevated, of a flesh colour, tinged with yellow : the head and neck ash-coloured ; breast and belly whitish, clouded with grey ; the back grey also, and the legs of a flesh colour. This species resides in the fens the whole year, breeds there, and hatches about eight or nine at a brood, which are frequently taken and brought up tame ; their flesh is reckoned higher flavoured than that of the domestic goose. When wild, the goose lays but once in a year ; good keeping will cause the tame goose to rear two broods, and if the eggs be taken away in succession, she will produce a sufficient number for three. In the management of animals, as in
many

other instances, art improves upon nature ; the design of which is obviously to stimulate the industry and ingenuity of man. Although, towards winter, they collect in great flocks, they remain in the fens in all seasons. On the continent they are migratory, passing from one place to another in flocks of several hundreds, the whole forming a triangle, proceeding with the point foremost, and headed by a conductor, which tiring sooner than the rest, retires behind, and leaves his place to be filled by another. When they journey in small companies, they follow one another in a direct line. It is supposed that they are natives of all countries, being found in every part of the globe.

SOPHIA.

I have heard that geese live to a great age.

MR. HARCOURT.

Instances are related of their attaining to eighty or a hundred years.

AUGUSTA.

What induces the Lincolnshire goose-owners
to

to deprive them of their feathers in so wanton a manner.

MRS. HARCOURT.

Interest is the inducement, as you will perceive, when I tell you that the pens upon the table are the quills taken from the wing of that bird. Our beds and pillows are stuffed with their feathers, which require a preparation for that purpose, for drying them well in the sun; and when the juices, which would cause them to rot and putrify, are all exhausted, they are put into bags, and the dust beaten out of them with poles. Feathers form a considerable article of commerce, even between distant countries. Eider down, so much valued, on account of its lightness and warmth, for quilts and mattresses, is imported into England from Denmark, and grows beneath the feathers upon the breasts of those ducks that inhabit Hudson's Bay, Greenland, Iceland, and Norway. Dantzic supplies us with a great quantity of cock and hen feathers. The down of the swan is brought from the same place, and, from its snowy whiteness, makes beautiful muffs

muffs and tippetts. The ostrich feathers, used at the installation of the knights of the garter, are valued at a high price, which I suppose is caused by their scarcity. Muffs made of feathers of various kinds are beautiful, warm, and light. Sophia, can you recollect any part of the conversation that passed a few days ago, upon the mechanism of feathers, and their peculiar suitableness, as clothing, to the inhabitants of the air?

SOPHIA.

Nothing could be contrived so well adapted to the use for which they are designed. They form an elegant and commodious covering for birds, defending them against cold and wet, assisting them, by their warmth, to hatch their young, and protect them against the inclemencies of the weather. Their glossy smoothness promotes their progress through the air easily and uninterruptedly, being placed, with exquisite neatness, from head to tail, one folding over another with the closest uniformity. As a preservative to this nicety, the feathered tribes, especially water-fowl, are furnished

with a little bag, situated near the tail, containing an oily or unctuous matter, with which they prune and dress their feathers. A soft down lies close to the body, beneath the feathers, which preserves the bird from cold: it possesses none of the compactness and strength of those on the outside, that are exposed to wind and weather.

CECILIA.

I admire when I observe the exactness of birds in dressing their feathers. A quarter of an hour spent in the aviary has animated me frequently to greater neatness and regularity in my own person.

MRS. HARCOURT.

A lesson seasonably bestowed. You are too much inclined, my dear Cecilia, to be inattentive to that refined nicety, which is the best ornament to female beauty.

SOPHIA.

The construction of the quill feathers is admirably adapted to their use. The shaft or rib is exceedingly strong, which empowers it to resist the air, but the lower part of it is hollow:

low: and that above, but little inferior to it in strength, is filled with pith. The vanes, or webs, by which I mean those feathers that grow like fringes upon each side of the quill, are wonderfully contrived to catch hold, or clasp one another, and form an even, resisting surface, when the wing is expanded, so that not a single feather is deprived of its full force and impulse upon the air. The outward vane is narrow and bending downwards; whilst the inward one is broad and turning upwards, by which it unites with the exterior vane of the next quill, which spreads over it. The tips are all sloping, those of the interior vanes inclining to a point, towards the outer part of the wing, and the exterior vanes towards the body; so that, whether the pinion be extended or shut, the edge is as neatly sloped, and completely finished, as if trimmed constantly with a pair of scissors.

MRS. HARCOURT.

Here is the quill-feather of a goose: take the microscope, children, and examine the laminae, or small feathers, which compose the

136 *Mental Improvement.*

vanes. You will discover as much contrivance and design in each of those small parts, as in the whole feather.

AUGUSTA.

I should have thought it a perfect feather, if I had not seen it put into the glass. One side is thin and smooth, but the other edge is divided into two rows of hairs, broad at bottom and narrow toward the top.

CECILIA.

I see the hairs you mention very plainly: those on one side are straight: but those on the other are hooked.

CHARLES.

Do you remark that the hooked beards are always placed next those that are straight? I suppose that is for the purpose of bracing the laminae together.

SOPHIA.

Had these vanes consisted of one continued membrane, an accidental injury would be irreparable, and the poor bird must remain lame, and find a difficulty in flying, till the return of the moulting season.

HENRY

HENRY.

How large it looks! We should never know half these wonders without microscopes.

MR. HARCOURT.

We have been insensibly led from one thing to another till our time is fully spent. I designed to have related to you many entertaining particulars relative to the different methods of catching birds, but they must be deferred till a future opportunity.

HENRY.

Pray let us hear them to-morrow night. I wish it were not too late now.

MR. HARCOURT.

With all my heart. I promise to resume the same subject at our next meeting. Adieu!

CONVERSATION

CONVERSATION XXII.

HENRY.

MY mind was so taken up with the conversation last night, when I went to bed, that I dreamed of nothing but decoys and setting of traps. Pray, papa, begin to tell us those contrivances for catching birds which you had not time to relate.

MR. HARCOURT.

It is with great willingness I comply with your request, since I am certain your tenderness and humanity will never permit you to avail yourself of my information, to entrap or destroy a harmless bird wantonly. All creatures are given for our use, and are subject to our power. It is therefore allowable to kill them for food, or other necessary purposes; but the boy who is capable of inflicting pain, without any other motive than that vile and debasing

debasement one, of beholding the sufferings of the poor victim, is already hardened to a degree that prepares him for the perpetration of cruelty towards his fellow men, when arrived at manhood. Geese and ducks are caught by various means, in different countries. It would be tedious to repeat every particular method, as many of them have a great similarity; but there is one, used both in the East and West Indies, as well as in China, that is very curious. Charles is acquainted with it, and will save me the trouble of describing it.

CHARLES.

The fowler wades into the water up to the chin; and having his head covered with the skin of a dried gourd, called a calabash, approaches the ducks, which, unmindful of this object, suffer him to mix among them, when he takes as many as he pleases, with the greatest facility, by drawing them by the legs under the water. This method is often practised on the river Ganges, substituting the earthen vessels of the Gentoos instead of calabashes.

bashes. These vessels are what the Gentoos boil their rice in, and are called Kutcharee pots; when once they have been used, they look upon them as defiled, and throw them into the river, where they are picked up for the purpose I have mentioned.

MRS. HARCOURT.

The Chinese prefer tame ducks to wild ones; and, it is said, hatch great numbers by artificial heat. The eggs being laid in boxes of sand, are placed upon a brick hearth, to which is given a proper heat during the time required for hatching them. The ducklings are fed with the flesh of craw-fish and crabs, chopped small and mixed with boiled rice. In about a fortnight they are put under the care of an old duck, which teaches them to provide for themselves, being first habituated to a sampane, or boat, from which the whole flock, often to the number of three or four hundred, thus brought up, go out to feed, and return at command. About the time of cutting the rice, and reaping the crop, these duck-sampanes are commonly seen rowing up and
down

down the river, according to the opportunity of procuring food, which is found plentifully when the tide ebbs on the rich plantations, which are overflowed at high water. It is surprising to see thousands of ducks belonging to different boats, feeding upon the same spot promiscuously, return at a certain signal to their respective sampans, without a single stranger being found amongst them.

AUGUSTA.

Charles mentioned the Gentoos : as I do not know the meaning of the term, I request he will explain it.

CHARLES.

They are a people who inhabit the country of Indostan, in the East Indies, and profess the religion of the Bramins.

MRS. HARCOURT.

You do right, Augusta, to let nothing pass which you do not understand, without asking for an explanation. The catching of small birds, in the neighbourhood of London, is a trade followed by weavers, and other mechanics, who, during the months of March and
October,

October, exchange the close confinement of garrets, for a range in the open fields, where they subsist, for a time, upon the profits of this employment. The nets they use are made to correspond exactly with each other, and are generally twelve yards long and two and a half wide: they are constructed so as to flap over one another with such velocity as seldom to disappoint their owner of his prize, when the pullers are drawn. But all this apparatus would be ineffectual, without the assistance of birds to allure and seduce the wild ones into those very snares in which they themselves were once caught. The emulation for superiority of song, which excites the vocal tribes to vie with each other, is the means used to ensnare them. The nets being properly laid, and singing birds, in small cages, placed near them, the flur birds are braced by a silken string, tied under their wings round their bodies, and by that confined to a moveable perch fixed within the nets. The office of these birds is to call others to a contest with them for excellence. Upon the first

first perception of the approach of the wild birds, one of them gives notice to the rest, which produces the same tumultuous joy and ecstacy among them, as is heard in a pack of hounds upon discovering the scent. The invitation is given by what is called jirks, in the language of the bird-catchers, and is so loud and powerful as to stop the wild birds in their flight, and fascinate them to the very verge of the machinery prepared for their destruction. Artificial means are used to cause these call-birds to moult before the natural season, which renders their song more powerful than that of others : but the process is cruel, and many die under it, which enhances the value of the survivors to a surprising height : four or five guineas have been given for a single song-bird. The hens of every species are killed, and sold by the dozen for the use of the table ; but the cocks are generally preserved for the sake of their song.

MRS. HARCOURT.

The system adopted by the London bird-
catchers

catchers is ingenious ; but the hazardous contrivances to which the inhabitants of the Orkney and Feroe Islands are compelled, by necessity, are wonderful.

HENRY.

Pray, relate them.

MRS. HARCOURT.

The Orkney Isles lie to the north of Scotland. Multitudes of the inhabitants subsist upon the eggs of the birds which build upon the cliffs of the rocks, during the breeding season : but this precarious support is obtained at the utmost hazard of their lives. The dauntless fowlers will ascend the cliffs, which are of a tremendous height, and pass from one to another with amazing dexterity. Sometimes they are lowered from above by a rope, made either with straw or the bristles of a hog, which they prefer even to ropes of hemp, because it is not so liable to be cut by the sharpness of the rocks. One man, who stands upon the edge of the precipice, lets down his companion, and holds the rope, depending on his strength alone, which often fails, and the adventurer

venturer is dashed to pieces, or perishes in the sea.

SOPHIA.

The very recital makes me shudder.

MRS. HARCOURT.

The Holm of Noss is a vast rock, severed by some unknown convulsion of nature, from the island, about sixteen fathoms distant. It is of the same stupendous height as the opposite precipice, with a raging sea between. Several stakes have been fixed on the top of the corresponding cliffs, by some bold and fortunate adventurer, who must have attained the heights by extraordinary dexterity; a rope is fastened to these stakes on both sides, along which a machine, called a cradle, is contrived to slide; and, by the help of a small parallel cord, the daring fowler wafts himself across, and returns with his booty.

MR. HARCOURT.

Courage depends much, as to its kind, upon habit and education. The brave general of a vast army would appear a coward amongst these hardy islanders.

MRS. HARCOURT.

The cliffs of the Feroe Islands, which lie in the Northern Ocean, and are subject to Denmark, are extremely high, and greatly frequented by sea-fowl; the eggs, feathers, and flesh of these birds are the inducements which tempt the natives to explore the recesses of these vast precipices, both from above and below. When they purpose descending, they are furnished with a rope eighty or a hundred fathoms in length. The fowler fastens one end of this line about his waist and between his legs, recommends himself to the protection of the Almighty, and is lowered down by six others, who place a piece of timber on the margin of the rock, to preserve the rope from wearing against the sharp edge. Their dexterity in this dangerous employment is almost incredible to those who have never been inured to face such difficulties. They will place their feet against the front of the precipice, and dart some fathoms from it, with a cool eye survey the place where the birds nestle, and again shoot into their haunts. Sometimes the
fowler

fowler will spring from the rock, and with a fowling-net, placed at the end of a staff, catch the old birds as they fly towards their nests. When the dreadful task is finished, he makes a signal to his friends above, by means of a small line, fastened to him for that purpose, and they pull him up and share the hard-earned profit. The feathers are preserved for exportation : the flesh is partly eaten fresh ; but the greater portion is dried for winter provision.

CECILIA.

To what variety of hardships are we strangers, from the fortunate situation in which we are placed !

MRS. HARCOURT.

At other times they begin their operations from below. The party set out in a boat, and proceed to the base of the precipice which they design to ascend. when the person who is to climb the rock fastens a rope about his waist, and takes with him a pole, with an iron hook fixed at one end of it, to assist him in his progress. Thus equipped, he climbs, or is thrust up by his companions, to the first spot where he can gain a firm footing. Here

he lowers his rope, and brings up one of the boat's crew : others are hauled up in the same manner, and each is furnished with a rope and fowling-staff. Their progress to the higher regions is continued by the same means. When arrived at the heights where the birds frequent, they act in pairs : one of them fastens himself to his associate's rope, and is let down to the haunts of the birds beneath him ; but when the strength of the man above is unequal to the task of drawing him up again, he is overpowered, and both inevitably perish. The boat attends, and receives the booty. These expeditions often last several days. The nights they pass in the crannies of the rocks.

SOPHIA.

Nothing can be more applicable to the present subject, than some lines I read a few days ago, written by Shakespear.

How fearful

And dizzy 'tis, to cast one's eye so low !
The crows and 'roughs, that wing the midway air,
Show scarce so gross as beetles: half way down

Hangs

Hangs one that gathers samphire—dreadful trade!
Methinks he seems no bigger than his head:
The fishermen, that walk upon the beach,
Appear like mice; and you tall anchoring bark,
Diminish'd to a cock; her cock a buoy,
Almost too small for sight: the murmuring surge,
That on the unnumber'd idle pebbles chafes,
Cannot be heard so high:—I'll look no more;
Lest my brain turn, and the deficient sight
Topple down headlong.

CHARLES.

The treasures of the hawk's nest are obtained
by men let down from the summits of rocks
by a single rope.

CECILIA.

Do you call such rapacious birds treasures? I can perceive no use in taking them. They have neither voice nor gentleness to recommend them.

MR. HARCOURT.

They are less valued now than formerly, when hawking was in fashion; but there was a time when a good hawk, of the Norwegian breed, was esteemed a present worthy of a
a 3 monarch.

monarch. The diversion of hawking, which consists in the art of taking different species of wild-fowl by means of trained hawks, is very ancient, especially in Thrace and Britain. The love of this amusement prevailed amongst the ancient Britons, and descended to later times. The English nobility were devoted to it. A nobleman seldom appeared abroad without his hawk upon his hand; and the force of their example influenced their inferiors: all ranks partook of it in a degree; but the enormous expence that attended it, confined it principally to the great. In the reign of James the First, Sir Thomas Monson is said to have given one thousand pounds for a cast of hawks. Rigorous laws were imposed for the preservation of an exclusive right to this diversion. As far back as the reign of Edward the Third, it was made felony to steal a hawk, and imprisonment for a year and a day to take the eggs, even upon a man's own ground. In these arbitrary times, the poor were exposed to capital punishments, loss of liberty, and fines, for no greater crime than destroying

destroying a rapacious bird of prey; whilst the higher orders of society, who are bound by their rank to give good examples, spent the day in the ferocious sports of the field, and the nights in the most licentious profligacy and depraved sottishness.

CHARLES.

The picture you have drawn of our ancestors, places the elegant refinement of modern dissipation in the light of a step towards moral improvement.

MRS. HARCOURT.

Our vices are not so brutal as formerly; but they still are vices, and by wearing a more seductive appearance, are perhaps more dangerous. Pictures throw a light upon the manners and customs of the times in which they were painted. I have seen a picture of Harold, who contended for the crown of England with William the Conqueror, embarking on an embassy into Normandy, with a hawk upon his hand and a dog under his arm.

MR.

MR. HARCOURT.

The peregrine falcon inhabits the rocks of Caernarvonshire. The same species, with the gyr falcon, the gentil, and the goshawk, is found in Scotland, and the lanner in Ireland. The name falcon is confined to the female, which is fiercer, stronger, and more courageous than the male. The art of training hawks for this exercise is a science possessing terms peculiar to itself, the minutiae of which is only valuable to falconers, and those who are inclined to pursue the sport, which is now almost out of date in this country.

SOPHIA.

Birds are a class of animals peculiarly engaging. Their vocal powers, the beauty of their form and plumage, render them pleasing ; but their most interesting property is the agreement of their endowments and habits with their several natures.

MRS. HARCOURT.

I am pleased with your observation. Give us some instances of the agreement you mention.

SOPHIA.

SOPHIA.

Birds of prey, which feed wholly upon other creatures, are not only fierce and savage in disposition, but are furnished with bills hooked at the ends, for tearing their victims; and with strong legs, and hooked, sharp claws, to enable them to hold it with a firmer gripe. The bills of crows are straight and strong, for picking: in water-fowl, that live upon fish, they are long and pointed, for striking; in others, slender and blunt, for searching in the mire: and those of the goose and duck tribe are flat and broad, for gobbling. Those birds that have long legs, have generally a long neck, or it would be impossible for them to reach their food from the ground. The power of refracting, bending, or stretching out the neck, is possessed in an eminent degree by birds in general; and among other advantages that result from it, that of poising themselves in an exact equilibrium is none of the least. There are a few birds whose wings are too short to enable them to fly; as the ostrich, cassowary, penguin,

guin, &c. but they assist the former in running, and the latter in swimming or diving, serving them as fins. The tail is used as a guide or rudder, to direct their course through the air; for, as the head turns one way, the tail is inclined to the opposite direction. It also poises their long necks, and preserves an even balance. Their peculiar ability to sustain themselves, and pursue long journeys through so thin an element as the air, is said to be assisted by a power they enjoy of enlarging their bulk when they have occasion. This admirable contrivance is effected by air-vessels, dispersed over various parts of the body, even to the bones, and communicating with the lungs. As these vessels are filled or emptied, the body is contracted or dilated, and consequently rendered heavier or lighter, as the inclination of the bird requires. Many similar observations might be added, but at this moment I do not recollect them.

CHARLES.

It is one of my greatest amusements to observe the flight of different birds. They have each

each a distinct character, and are endued with different powers of swiftness: were it otherwise, the weaker must always inevitably yield to the rapacity of the strong and voracious. Many are preserved by flitting from place to place with a restless agility that the larger kinds cannot imitate. Those which live upon the water secure themselves by diving. Kites and hawks glide smoothly along; woodpeckers fly awkwardly and by jerks, as if in danger of sinking; but, above all, I admire the elegant swiftness and agility of the swallow tribe: they seem as if they could live always upon the wing.

CECILIA.

Brother, you are skilled in distinguishing the nests of different birds; favour us with some account of the most curious kinds.

CHARLES.

They are all curious, and adapted with wonderful sagacity to the habits and wants of each instinctive architect. The study of nests has indeed formed one of my most agreeable relaxations; but I am proud to boast that I
have

have never robbed one of those anxious mothers of their treasures, or disturbed her in the fond office of rearing her young. The larger rapacious kinds make their nests of sticks and bents, but line them with something soft. Most of them chuse solitary places for their residence, such as high rocks, ruined towers, &c. a few of them build upon the ground. Parrots, and all birds with two toes forwards and two behind, lay their eggs in holes of trees. Crows build in trees. The nest of the magpie, though composed of rude materials, is made with exquisite art, covered with thorns, like defensive armour, and only a small hole left for an entrance. The ostrich is celebrated for neglecting her young : she lays her eggs upon the sand, and abandons them to chance. The mode and place of building among small birds vary : some build in bushes ; others in holes of walls, or upon banks ; and some upon the ground. Swallows make a curious nest, different from any other : clay, moistened with water, is the material they use. The Chinese eat the nests of one of this species, which

which are formed of a glutinous matter, and esteem it a great delicacy. Web-footed fowl breed on the ground. Ducks strip the down from their own breasts to prepare a soft bed for their young. In very hot climates, where monkeys and serpents abound, many birds use a wonderful precaution to secure their young from their treacherous attacks: they build a pendulous nest, hanging at the end of a bough too slender to support their dreaded enemies.

CXXIIA.

The taylor-bird, a native of the East-Indies, makes a very extraordinary nest of that kind: she picks up a dead leaf, and sews it to the side of one growing upon a tree; her slender bill is the needle, and some fine fibres her thread. When she has formed this external coat, she lines it with feathers, gossamer, and down; his fragile habitation is proportioned to its tenant. She is but three inches long, and weighs only three-sixteenths of an ounce.

MRS. HARCOURT.

Before we separate, I wish to draw your

attention to the *force of habit*, which, when applied to dexterity, activity, and courage, seems capable of overcoming the very propensities and powers of nature; as is exemplified in the suspension of the breath amongst divers, who can remain a long time under water. The agility of the climbers of rocks exceeds any powers that persons unaccustomed to the exercise are acquainted with; and various other employments call forth faculties and capacities, that would for ever remain dormant, unless excited by necessity, and confirmed by habit. Let us, each one, vigorously apply this principle to the practice of virtue, and the subjection of every improper inclination and propensity; and we may rationally hope, in time, to attain to an advanced degree of moral perfection. Adieu, dear children.

CONVERSATION XXIII.

CECILIA.

AS I was paying my daily visit to my bees this morning, and watching their motions, I thought that entertainment might be derived from some particulars relative to the order and discipline by which they are regulated, not inferior to that we enjoyed in the recital of the qualities of birds.

MR. HARCOURT.

Could we pursue the peculiarities of instinct, through all its variations, in the different orders of animals, it would supply us with an inexhaustible source of admiration and instruction; but as many of them are placed beyond the reach of our observation, we must content ourselves with the investigation of those that are obvious to our notice, among which the bee has ever been distinguished.

MRS. HARCOURT.

The history of the bee deserves our attention; for, although almost every country housewife furnishes her cottage garden with hives; yet the wonderful instincts that guide this small insect, are known only to the observers of nature. Cecilia has spent much of her leisure in observing the economy of those that I have put under her management, and is qualified, by experience, as well as by reading, to give us information upon the subject. We have examined together the structure of the parts of the bee in the microscope. An exact description of them will show their conformity with the purposes for which they are designed; therefore, my dear, begin your account with them.

CECILIA.

The honey-bee, for there are many kinds, is divided into three parts, consisting of the head, the breast, and the belly, which are united by two ligaments. The eyes are black, and of an oblong form, guarded by a horny tunicle or covering. The horns, mostly called antennæ,

antennæ, are placed between the eyes, near the middle of the head, and assist the insect in feeling its way, when the eyes are useless for want of light. The jaws open sideways, and being armed with teeth, serve to remove every thing offensive or inconvenient that is found in the hive. In their wars with each other, they use their teeth, and the wounds they inflict with them are supposed to be fatal. Their long trunk, or proboscis, is of very curious construction; it enables them to penetrate the inside of flowers, and extract their delicious juice; it is long and taper, and so pliant and flexible, that it can be contracted and folded up at pleasure. Four strong scales are contrived to preserve this valuable member from injury, two of which form a sheath to it, whilst the whole is enclosed in the larger pair. From the breast, which is of a dusky colour and oblong form, proceed two wings, and three legs on each side. The belly is divided into six rings or folds, which, by sliding over one another, serve to shorten or lengthen the body. Besides the intestines, it

contains a bag, which is used as a receptacle for the honey they collect. The juices of flowers are conveyed into this bag from the proboscis, through a narrow pipe, which passes the head and breast. The legs are finished, in every part, with the greatest nicety: the hindmost ones are hairy, and streaked crosswise on the inside. Within the thigh of the working bee is a hollow place, edged with hair, where the bee loads the materials for wax, in little pellets, as large as a pepper-corn. Each foot terminates in two hooks, with the points opposite to each other; between these claws is a little thin substance, which, when unfolded, enables the insect to fasten to glass, or any other highly-polished body. The sting is situated at the extremity of the belly, and is composed of two bearded darts, enclosed in a horny sheath, which has an opening near the end, for the passage of the darts; at the root of the sting is placed a small bag, filled with a venomous liquor, which is emitted through the sheath into the wound made pteviously by the darts. Mr.

Derham,

Derham, who is celebrated for his curious microscopical observations, relates that he counted eight beards, like those of fish-hooks, upon each dart in the sting of a wasp ; and the same number may be seen, with good glasses, in that of a bee. One of these darts is rather longer than the other, and pierces the flesh first ; the other follows instantly. They penetrate, deeper and deeper, alternately, with their beards or hooks, till the whole sting is buried in the flesh, and then the insertion of the poisonous juice finishes the process. If the person who is stung has presence of mind to remain still, the bee instinctively draws the beards close to the sides of the darts, and the sting comes out whole ; but if the insect is disturbed, and attempts to draw the sting hastily, the beard prevents its return, and it is generally left in the wound, which increases the pain and retards the cure.

HENRY.

I was stung severely last summer, which makes me run away whenever I hear a bee or wasp buzz near me.

MRS.

MRS. HARCOURT.

It would be wiser to remain quiet, without changing your posture. There is scarcely any danger to be apprehended from them, even were you surrounded by a whole swarm, unless you excite their resentment by moving or buffeting them.

AUGUSTA.

Why do you particularize the working bees; are there more kinds than one in the same hive?

CECILIA.

The working bees form the great body of the hive, which is always governed by a sovereign queen, of whom I shall give you a particular description presently. She has also another kind of subjects, called drones, which differ considerably from the labourers.

AUGUSTA.

I have frequently amused myself with looking at bees, as they were flying from one flower to another; but I never observed any distinction between them.

MRS.

MRS. HARCOURT.

The want of accurate observation is the general source of ignorance. Exert all your diligence, children, to acquire the habit of seeing every thing with an attentive eye. Common objects are mostly regarded with indifference by the thoughtless and ill-educated; and had not philosophers bestowed a patient investigation upon many things esteemed trivial and insignificant, some of the most useful and curious discoveries in natural history must have remained unknown. Now, Cecilia, to satisfy our impatience, acquaint us with the offices and dignity of her humming majesty.

CECILIA.

The body of the queen bee is longer and larger than that of the rest of the swarm. As she seldom leaves the hive, except for the purpose of settling a new colony, she has but little occasion for dexterity in flying; her wings are indeed but ill adapted to that exercise, being short, and scarcely reaching beyond the middle of her body, the hinder part
of

of which is more taper, and terminates sharper than the bodies of the other bees. The under part of her belly and her legs are of a brilliant gold colour. She is the mother of the hive, as well as its sovereign, and is followed, wherever she goes, with the most dutiful obedience, by her children and subjects. A hive cannot subsist without a queen, as she is the only female which produces eggs; nor do they ever permit more than one of them to remain alive in the same hive. If she happens to find a rival, they fight till one is killed; being armed with a powerful sting, which she seldom uses, except in contests for empire, or when unusually provoked. The queen bee is very prolific, laying several thousand eggs every season. She generally lies concealed in the most secret part of the hive, and is never visible but when she deposits her eggs in those combs which are exposed to view. She is always attended by ten or a dozen of the common bees, which form a kind of retinue: these courtiers follow their mistress with a solemn pace, in her progress from one cell to another.

She

She examines, with care, the cell where she intends to leave an egg, lest there should be honey, wax, or any embryo in it. If she finds it empty, she fixes a small white egg to the bottom of it, which is composed of a thin membrane, or skin, filled with a whitish liquor. Should the queen inadvertently lay more than one egg in the same cell, her attendants, the working bees, remove the supernumerary one. When a queen dies accidentally, the whole community desists from its accustomed labour, consumes the store of honey, and its members fly about their own hive, and others that are near them, at those hours when they should be at rest: they pine away with grief, and mourn her loss by a clear and uninterrupted humming, which should be a token to their owner, either to take the remainder of the honey, or to find them a new sovereign; at the sight of whom joy returns, and her presence animates the whole hive to fresh exertions to industry and activity.

MR. HARCOURT.

Charles, I think you are acquainted with the
secret,

secret which enabled Mr. Wildman to astonish every body, by the extraordinary feats he performed with bees.

CHARLES.

The facility with which he managed them appeared like magic. He found the means of making a swarm alight just where he pleased, in a few moments. Sometimes he commanded them to settle upon his head, or to form a beard upon his chin, hanging one by another : then he would order them to remove to his hand, or any other part of his body ; or, if more agreeable to the company, he would place them upon the window, table, &c. They seemed to be completely under his control.

HENRY.

How was that possible? Bees cannot understand our language.

CHARLES.

He made use of words only to deceive the spectators. The magical wand which he used to transfer them from place to place was the queen bee. He placed all his dependence
upon

upon their fidelity and attachment to her; for he knew that wherever she was carried, the swarm would certainly follow. Repeated experiments taught him, that after turning up a hive, and tapping it upon the sides and the bottom, the queen immediately appeared to know the cause of the alarm, but soon retired again among her people. By seeing her frequently, he learned to distinguish her at the first glance; and practice enabled him to lay hold of her so tenderly as not to endanger her person. Having thus secured the queen, he slipped her gently under his left hand, without injuring her, or enraging her to sting him. Then he replaced the hive, and retained her as his prisoner, till she was missed by the bees, who, as soon as they perceived their loss, took wing with the greatest confusion. Whilst they were seeking their beloved sovereign, he placed her upon the spot where he wished them to settle. The moment she was discovered by a few, they gave notice to the rest, till the joyful news was communicated to the whole tribe, upon which they all assembled

round her, and remained a long time in that situation, as if afraid of being deprived of her again.

SOPHIA.

This ascendancy over them must have appeared unaccountable, before the principle was known by which it was obtained; but Mr. White, in his History of Selborne, mentions an idiot boy, that lived in that village, who acquired an equal command over them, without any knowledge to guide him in his pursuit. He showed no understanding upon any other subject; and during the winter season he would doze away the chief part of his time in the chimney corner; but as soon as warm weather returned, he resumed his only diversion, which was searching for bees in the fields, or upon sunny banks. He would catch them with his bare hands, without fear of their stings; then he would disarm them of their weapons, and suck their bodies for the sake of their honey-bags: nay, so far would he carry his temerity, that he would sometimes fill his bosom, between his shirt and his skin,

skin, with a number of them. He would slide into gardens where bees were kept, and, sitting down before the stools, would rap with his fingers upon the hives, and so take the bees as they came out. He has been known to overturn hives for the sake of the honey, of which he was immoderately fond; and, as if his imagination was impressed by this one object, he had a habit of imitating the buzzing of bees with his lips, as he ran about the fields and gardens.

MR. HARCOURT.

This account is very extraordinary. The circumstance seems to have arisen from one of those natural propensities which we are unable to explain.

AUGUSTA.

My curiosity relative to the queen is pretty well satisfied. I long to know, now, what office is assigned to the drones.

CHARLES.

The common drones, though smaller than the queen, are larger than the working bees, and in flying make a greater noise: they have

no sting; neither are their proboscis, or feet, adapted for collecting wax and honey. They are the males, and are found in the hives only at certain periods of the year. Economy impels the working bees to destroy the drones at the approach of winter: they do not even suffer an egg or a maggot of that kind to escape, but exterminate the whole race, as useless, after the season for increasing the young stock is past; and they begin to provide a magazine, to supply the swarm with food during the cold weather, when no fresh honey can be procured. The working bees are the most numerous part of the state. They have the care of the hive, collect the honey and wax, make and work up the wax, build the cells, feed the young, keep the hive clean, defend it from intruders, and perform every thing necessary to be done for the benefit of the commonwealth. As the labourers are the guardians of the hive, the sting is a requisite weapon for them to resist the attacks of their enemies; for there are many lazy, greedy insects,

insects, which will attempt to devour them as well as their honey.

HENRY.

You said that the working bees destroyed the maggots of the drones; do bees undergo the same changes as silk-worms?

CECILIA.

On the third or fourth day after the egg is laid, a worm or maggot is produced, which, when it is grown so large as to touch the opposite corner of the cell, coils itself up into the shape of a semicircle, and floats in a liquid which sustains it and promotes its growth. The working bees are very attentive in supplying the worms with a sufficient quantity of this liquor, which is conjectured, by some naturalists, to be a mixture of water with the juices of plants and flowers, collected purposely for the nourishment of the young, whilst in that helpless, tender state. The working bees continue to feed the worm for about eight days, till one end touches the other in the form of a ring; when it begins to feel the first posture uneasy, it ceases to eat,

Q 3

and

and unrolls itself by degrees, thrusting that end forward towards the mouth of the cell, which is to be the head. The task of the attendant bees is now changed from that of feeding the worm, to fastening up the top of the cell with a lid of wax, and cherishing the brood, and advancing the approaching transformation by their natural heat. In this concealment the worm prepares a web of silk in the manner of the silk-worm. This web forms a lining to the cell, and affords a convenient covering for the change of the worm into a nymph or chrysalis. In the space of eighteen or twenty days, the change is effected, and the bee endeavours to extricate itself from its dark and narrow prison, by forcing its way with its teeth through the lid of the cell. One horn appears first, then the head, and at last the whole body. This expansion to life and liberty is sometimes the work of half a day. The bee, when released from its fetters, stands upon the surface of the comb, till it has acquired its natural complexion, and a degree of vigour and maturity to enable it to labour.

The

The rest of the bees gather round it in this state, celebrate its birth, and feed it with honey out of their own mouths. The shell of the chrysalis, and the scattered pieces of wax which are left in the cell, are removed by the working bees; and the receptacle is no sooner cleared from the relics of its former inhabitant, and ready to receive another, than the queen again deposits an egg in it. The hair which covers the bodies of the young bees, being whitish, causes them to have the appearance of a grey colour; but they gradually lose that hue, and become brown.

MRS. HARCOURT.

As the eggs which are destined to become drones, are to produce larger insects than those of the common bees, so they are laid in cells of more extensive dimensions, and their coverings are raised convex, like a small dome, whilst the others are flat-roofed. Those cells which are intended for the reception of the royal maggots, are built upon a very different model to any of the rest: they are of a longish, oblong form, having one end bigger than the other,

other, with their outward surface full of little cavities. They are sometimes fixed in the middle, and at other times in the side, of a comb. Several common cells are sacrificed to form a foundation and support to it. As soon as the young queen comes out of her cell, it is destroyed, and the vacancy filled up with common cells; but, as the base remains, the comb is found thicker in that part than in any other. There are apartments prepared in every hive for the rearing of several queens, lest by any accident they should be deprived of their sovereign mistress, and have none to replace her. When the members of the commonwealth are become too numerous for the extent of their city, by the addition of the young brood, a part of them, conducted by one of the young queens, leaves the parent state, and seeks a more convenient situation elsewhere. A new swarm is always composed of a queen; several thousand working bees, among which there is a mixture of old and young; and some hundreds of drones. The moment the colony has chosen a new residence,

dence, the labourers begin to work with the utmost diligence, to procure materials for food and building. Apparently conscious that their queen is ready to lay her eggs, they are more anxious to provide cells for her progeny than for storing of honey. Such is their industry, that they will form combs twenty inches in length, and proportionably wide, in the space of a day and a night. If the weather is favourable, they make more wax during the first fortnight, than in all the rest of the season.

CHARLES.

The community of bees does not excel in the arts of peace only; it is skilled in the destructive science of war. I have seen whole hives engaged in a pitched battle. When one state has been, by some circumstance, plundered of its honied store, hunger and necessity have compelled its members to seek a fresh supply in a neighbouring hive, from which they have been vigorously driven away by its owners. Great skill is observable in
these

these contests, in the manner of pointing the sting between the scaly rings of their adversaries' bodies : but it often happens that the conqueror gains the victory at the price of his life ; for if he leaves the sting in the wound, part of his bowels follow it, and certain death is the consequence.

AUGUSTA.

The construction of the combs must be very curious. I long to hear a minute description of the inside of the hive, and the method used by the bees in working.

MRS. HARGOURT.

Our subject has far exceeded the limits I expected. Many things relative to this interesting topic remain to be explained : but the evening is far advanced, and Cecilia must resume her information to-morrow night.—
Adieu, my beloved children.

CONVERSATION

CONVERSATION XXIV.

MRS. HARCOURT.

WE are assembled earlier than usual, which is rather fortunate, as I conjecture we shall find sufficient matter for a long conversation.

AUGUSTA.

However late it may continue, I shall not think it tedious. The particulars I have already heard, only excite me to wish to hear more concerning the bees. I shall not be satisfied till I possess some of my own, and examine the reality of what Cecilia has told me. I shall depend upon her assistance to teach me how to manage them.

CECILIA.

The little knowledge I have, you will be welcome to : ~~and it will give me great pleasure~~
to

to be your associate in this scheme, the plan of which we will arrange hereafter. A hive of bees may, with propriety, be compared to a well-peopled city, in which are commonly found from fifteen to eighteen thousand inhabitants, subsisting under the most perfect discipline of wise laws. The regulation of labour among them is very exact. They are divided into four companies, one of which roves in the fields, in search of materials for building: another is employed in laying out the bases and partitions of their cells; a third is occupied in polishing and smoothing the sides of them; and the fourth company brings food for the rest, or relieves those which return oppressed with their burdens. But the same bees are not confined constantly to the same labour. Their tasks are frequently changed. Those which have been engaged in the hive are indulged in making excursions abroad, whilst those which have enjoyed the wholesome freshness of the air, submit, without reluctance, to confinement within. They appear either to have a language of their own, or to understand

understand one another by signs. When one of them is in want of food, it bends down its trunk to the bee from which it expects assistance, whilst this last opens its honey-bag, and suffers some drops to fall for the needy one, which stands ready to receive it. So admirably is the work distributed, and so great is their diligence, that in the course of a day, they are able to build apartments, sufficiently numerous to contain three thousand inhabitants.

SOPHIA.

The advantage of order and regular arrangement is shown in the policy of this small insect. Were the bees guided by no rule, instead of providing for the accommodation of such numerous inhabitants, confusion must perplex their designs, and they would interrupt one another in the progress of their work, like the builders of the Tower of Babel.

MRS. HARCOURT.

Their sagacity in constructing and distributing their cells is equally admirable. In their manner of building, the bees have attained

three essential points, aimed at by all good architects: the two first of which are the greatest possible economy of room and materials; and the last is to procure all the accommodation that can be obtained in the space allowed for the edifice. The form of their cells is a hexagon, or figure of six equal sides. If you examine it, you will see that the circumference of one cell makes part of the circumference of those adjoining to it, which is a saving of the wax as well as the space, none of which can be lost where there is no void between the apartments. The third advantage will be more difficult to your comprehension, as it depends upon mathematical knowledge; but those who are skilled in that science, tell us, that the hexagon affords more space than any other figure that can be joined together. Their frugality induces them to make their partitions very thin; but they strengthen the entrance of the cells, which are most liable to be injured, by a fillet of wax quite round them, which makes them three or four times thicker than the sides; and the bottom

tom is supported by the junction of three cells exactly beneath the middle of it; for they are careful to place them in such a manner that the middle of the bases of one row is directly opposite to the angles of the next to it. The combs lie parallel to each other, and there is left between every one of them a space which serves as a street, broad enough for two bees to pass by each other. There are also holes which go quite through the combs, and may be compared to lanes, for them to pass from one comb to another, without being obliged to go a great way about.

HENRY.

I should like to watch a hive of bees, from the laying their foundations to the completion of the comb.

CECILIA.

That would not be easy to accomplish, for notwithstanding glass hives and other contrivances have been used with that design, there are such numbers in continual motion, and they change their places so quickly, that it appears only a scene of confusion. Some of

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them

them, however, have been observed to carry pieces of wax in their talons to the place where the others are at work upon the combs, which they fasten to the work with their feet. Others have been seen running about, and beating the work with their wings and their tails, perhaps for the purpose of hardening it, and making it stronger. Whilst some of the bees are busied in building and forming the cells, others are employed in polishing those already made; the smallest roughness is taken off with their talons. They continue patiently at this task till they have completed it, never leaving off, except to carry away the particles of wax they scrape off, which others receive from them, and employ in raising other parts of the edifice.

HENRY.

Since I have heard so many curious things about the bees, I have spent all my play-time near Cecilia's hives; and yesterday I saw several bees loaded with little balls of yellow wax sticking to the hollow place in their thighs.

CECILIA.

CECILIA.

The balls which you observed are not wax, but a powder collected from the stamina of flowers, many of which abound with it ; in the lily it is very visible, as you must have often experienced, if ever you have pulled any of them to pieces.

HENRY.

O yes, I know what you mean ; my fingers have been covered with it sometimes.

CECILIA.

This powder, or pollen, as it is properly called, does not become wax till it has undergone a process in the stomach of the bee. In collecting this substance, which is the material that composes the comb, the bee enters into the cups of flowers, particularly such as afford the greatest quantity of it. As the insect's body is covered with hair, it presently gathers a good deal of this dust, by rolling itself within the flower ; this it brushes off with its hind legs, and kneads into balls, which it pushes into those two hollow places I mentioned before. In this pursuit the bee flies from flower

to flower, till it has accumulated as much as it can carry, and then returns home with its treasure. Upon its arrival at the hive it frequently happens that three or four other bees assist in relieving it of its burden, by each eating a share of the cargo. It is not a desire of food that urges them to swallow this substance, but an earnestness to provide a supply of real wax for making the combs. At other times, when there is no immediate want of wax, they lay it up in repositories, to serve for the supply of future occasions. After having^g swallowed it for some time, they have a method of returning it, when they want it for use; and it is only when in this soft and pliant state that they can apply it properly in the making of combs. It is supposed, by the quantities they collect, that a great deal of it is laid up for food. In this state it is known by the name of bee bread.

MRS. HARCOURT.

The crude wax, by which I mean the material which they swallow to make wax, is not always yellow, but varies, according to the flowers

flowers from which it is gathered. The combs are at first white, but are changed to yellow, by the steam and impurities arising from so many insects confined in one place. Honey, which is their principal treasure, is originally a juice digested in plants, which exudes through their pores, and exists chiefly in their flowers, or in reservoirs called honey-cups, of various forms, and differently situated in different flowers. The bees obtain the honey, either by penetrating into these recesses, or they collect it when exposed upon the surface of the flower. This precious spoil is carried home in their stomachs; so that, though heavily laden, they appear to a superficial observer, as if they had procured nothing by their excursion. Bees are equally fond of another substance, called honey-dew, of which there are two kinds, both being produced upon vegetables, though arising from different causes. The first kind, which is commonly supposed to be a dew that falls upon trees, is nothing but a mild, sweet juice, which, having circulated through the vessels
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of vegetables, is separated in reservoirs in the flowers, or on the leaves, where it is properly called the honey-dew. Sometimes it resides in the pith, as in the sugar-cane; and at others in the juice of pulpy summer-fruits, when ripe. Manna, which is found on the ash and maple trees of Calabria, issuing from their leaves and trunks, is a species of honey-dew. The second kind is produced by a small insect, and supplies the bees with a resource, when the spring flowers are gone, and the dew, which transpires from the plants, is no longer to be obtained.

CECILIA.

There is yet another substance collected and used by bees, but I cannot say, with any certainty, where they procure it. Some suppose that they meet with it on the birch, the willow, and the poplar. It is a resinous gum, of a more gluey quality than wax, and different from it in many respects. The use to which they apply it, is to plaster the inside of their hives, and to fill up the most minute crannies that may chance to be in them. It was called
by

by the ancients, *propolis*. When they begin to work with it, it is soft; but in length of time it acquires a brown colour, and becomes much harder than wax.

AUGUSTA.

Do not the bees lay up a store of honey against the winter season?

CECILIA.

As soon as they reach the hive with a load of honey, they deposit it in an empty cell. They have two sorts of storehouses: one is filled only with honey that is intended for the supply of accidental wants; the other contains their winter store, which they are careful to preserve, by several sagacious precautions. There is, in each cell, a thicker substance, something like a cream, which is placed over the honey, to prevent it from running out; this gradually rises as the cell is filled: when it reaches the top, the bees close up the cell with a covering of wax, and it remains untouched, till necessity compels them to have recourse to it.

CHARLES.

CHARLES.

It is wonderful to see them hang by one another in a heap or cluster, when they settle in a swarm. I cannot think how the bees, from which the others suspend themselves, can bear so great a weight.

CECILIA.

When a swarm divides into two clusters, it is a sure proof that there are two queens among them, one of which must be destroyed before they will unite and settle quietly. Their instinct is as admirable in providing for their own safety and well-being in some other respects, as in those I have already remarked. They defend the hives from the intrusion of other insects, by glueing up every avenue by which they might gain an entrance; and sentinels are appointed to watch the mouth of the hive to prevent the admission of a stranger; but if a snail, or other large insect, should, by any means, elude their vigilance, they sting it to death, and incrust it with a coat of propolis, to prevent maggots, or a disagreeable smell issuing from the putrefaction

faction of so large an animal. It is conjectured that bees are sensible of the approach of bad weather. You may sometimes see them, though ever so busy at work, suddenly desist from their labour, and return home in such crowds, that the door of their habitation cannot admit them. Look at the sky, and you will perceive the cause of all this bustle, in the gathering of small clouds that foretel rain. It is said that no bee is ever caught even in a sudden shower, unless at a great distance from home, or in a sick or disabled state. They crowd together in the middle of the hive, in order to protect themselves from the cold, which is very injurious to them. Upon every occasion, they appear to be endued with a sagacity superior to most other insects of whose economy we are informed.

CHARLES.

I think there are several species of bees. Can you favour us with particulars relative to any of the rest.

CECILIA.

Linnaeus enumerates fifty-five; some of which

which live in society, whilst others dwell and labour in solitude, building cradles for the reception of their infant progeny : as the leaf-cutter bee does with the leaf of the rose-tree ; the upholsterer with the gaudy tapestry of the corn-rose ; the mason-bee with a plaster ; and the wood-piercer with saw-dust. Various are the modes of building, as well as the materials they use, according to their different instincts, and the climates they inhabit. The honey-bee, which has taken up so much of our attention, is, in some degree, domesticated, and its manners differ from those in a wild state, as hives are provided by man for it to build its comb in.

MRS. HARCOURT.

The management of bees is an art which it would take up too much of our time to define ; but some observations relative to it will serve to illustrate what has been already said. The first care is to chuse a situation for the apiary, that is neither too much exposed to the rays of the sun, nor to the cold. A supply of food is the next consideration, which greatly depends

depends upon the abundance of those plants in the neighbourhood which yield honey in plenty. Thyme, heath, and broom, are thought excellent for the purpose, as well as many others which I shall pass over. As some situations are deficient in this respect, at certain seasons, contrivances have been used, in countries where bees form an essential branch of agricultural economy, to remove them from one place to another. In many parts of France, it is not unusual to see floating bee-houses. They will put from sixty to a hundred hives on board one barge, well defended from the injuries that might be occasioned by an accidental storm. By this conveyance they float gently down the river, feeding on the flowery pastures on its banks; and, by the honey they collect during the voyage, repay their owner for the trouble of removing them.

MR. HARCOURT.

Pliny relates a similar custom among the ancients. The Egyptians also avail themselves of the advantage of difference of climate between

Upper and Lower Egypt. The productions of spring are full six weeks forwarder in Upper Egypt, which induces the bee-owners of the lower division to embark their hives on the Nile, at the proper season for reaping the benefit of the advanced state of vegetation in that country, and to bring them back time enough to collect the rich produce of the fields in their own neighbourhood.

CHARLES.

This is one, among numberless instances, of the improvement that animals receive from living under the government of man. This well-chosen change of situation affords them an opportunity of making a much larger quantity of honey, than they could possibly do if left to themselves.

MRS. HARCOURT.

Consistently with that wisdom which shines forth in every part of creation, insects that feed upon leaves, flowers, and green succulent plants, are generally in a torpid, inactive state, during the winter, when they cannot provide themselves a subsistence abroad.

Though

Though bees are pretty much in this state, and eat little, whilst cold weather lasts, yet, if their honey be taken away, they require to be supplied with a sufficiency for their support, or they must inevitably perish.

SOPHIA.

It appears to me the height of ingratitude and cruelty to destroy the bees, when we rob them of their treasure.

MRS. HARCOURT.

It is a common practice to destroy these industrious, useful insects, when their hives are plundered, by digging a hole near them, and putting a stick into the hole, at the end of which is fastened a rag that has been dipped in melted brimstone; the rag is set on fire, the hive is placed over it, and the earth is immediately thrown up all round, so that none of the smoke escapes. In a quarter of an hour all the poor bees appear to be dead, and are soon irrecoverably so, by being buried in the earth that is returned back into the hole.

AUGUSTA.

This is a small requital for all their labour and ingenuity.

MRS. HARCOURT.

Many ingenious persons have applied their talents to the invention of schemes to prevent this cruelty. The most elegant and successful that I have seen is effected by placing a flat, round board, perforated with holes sufficiently large for the bees to pass easily through, over the hive: upon this board stands a glass, formed a little like a flower-pot, smallest at bottom, and expanding at top; this may be covered by another board, to serve as a foundation for a second glass; additional stories, in like manner, diminishing in size till they form a pyramid, may likewise be raised to what height the owner pleases. When the bees have filled their hives, they continue to work upwards, filling not only the glass hives rising one above another, but also small bell glasses, placed over holes made of the edges of the boards, till they are all stored with wax and honey; which is obtained by removing

removing these glasses when full, and placing empty ones in their stead: the bees, finding room and employment for the young swarms, remain in their habitation, without attempting to colonize. This apparatus is expensive, and for that reason can be adopted only by persons of fortune: but wooden hives, constructed upon a similar principle, will probably, in time, come into general use, as they will be found to unite profit with convenience.

SOPHIA.

I read a wonderful account, a little while ago, in the *Philosophical Transactions*, of a bird, found in the interior parts of Africa, called the *indicator*, or *honey-guide*, which directs travellers to the spot where honey is to be found. It is a species of the cuckoo, but much smaller than that which frequents Europe. Honey being its favourite food, it is prompted by self-interest to point out the place where the booty is concealed, as it is generally repaid for its intelligence, by a part of the spoil. The morning and the evening

are the times in which it searches for food, and it is then heard calling, in a shrill tone, *cheer, cheer*; a note which immediately draws the attention of the honey-hunters, as they consider it a signal for the chase. From time to time they answer with a soft whistle, which the bird hearing, continues its note. As soon as it perceives the men, it flutters gradually to the place where the bees are situated, continually repeating its former call of *cheer, cheer*: nay, if it should happen to have advanced considerably before the hunters, (who are very liable to be impeded by bushes, rivers, &c.) it returns to them again, and redoubles its note, as if to stimulate them to more activity. At last the bird is observed to hover for a few moments over a particular spot, and then to retire silently to a neighbouring bush, or resting-place, and the hunters are sure of finding the bees' nest in that identical spot; whether it be in a tree or in the crevice of a rock, or, as is most commonly the case, in the earth. Whilst the hunters are busy in taking the honey, the
bird

bird is seen looking on attentively to what is going forward, and waiting for its share of the spoil. The bee-bunters never fail to leave a small portion for their conductor, but commonly take care not to give him sufficient to satisfy his hunger, but only a taste, that may incite him to seek for another nest.

MR. HARCOURT.

The instinct of this cuckoo is admirable, and properly introduced. Wax and honey are the productions which invite man to plunder the stores of the bees. Wax forms a very considerable article of commerce, the quantity of it consumed in the different parts of Europe being almost incredible. There are two kinds of it, used for different purposes, white and yellow : the first is bleached by art ; the last is as it comes from the hive. After the honey is taken out of the comb, the remaining matter is put into a kettle, with a sufficient quantity of water, then it is melted over a moderate fire, and strained through a linen cloth, by means of a press : the scum is taken off before it is cold, and it is poured into moulds made of

of wood, earthen-ware, or metal. The bleaching of wax, or rendering it white, is performed by spreading it into very thin cakes, and exposing them on linen cloths to the air, both night and day; for the dew is as effectual in whitening it as the sun. When they are perfectly blanched by this exposure, they are melted for the last time, and cast, with a ladle, upon a table, covered over with little round dents, or cavities, of the size and form of the cakes of white wax sold in the apothecaries' shops. This wax is used for candles, torches, tapers, flambeaux, figures, and other wax-works. It is also an ingredient necessary in incaustic paintings. Plasters, cerates, and salves, acquire a consistency, by being mixed with it; and, in some cases, it is administered internally.

MRS. HARCOURT.

The basket of wax fruit, which stands upon the top of my cabinet, has deceived and disappointed many. As Sophia composed it, she will please to inform us what means she used to imitate nature so closely.

SOPHIA.

SOPHIA.

I buried the fruit I designed to copy half way in clay, and oiled its edges as well as the half that remained uncovered. Then I threw plaster of Paris over it as quickly as I could, making a thick coat: when this hardens, half the mould is formed; the other half may be obtained in the same manner. After I had finished my moulds, I joined them together, and poured a little melted coloured wax into them, through a hole which I made for that purpose, and then shook it about till the inside was lined with the wax. I imagine wax dolls are made in a manner something similar.

MRS. HARCOURT.

A very pleasant liquor, call'd mead, is made from honey. It is needless to tell you the most common application of honey.—If you retire into the next room, you will find supper prepared for you; and, among other things, part of a honey-comb, the produce of one of my bell-glasses, on the table, that you may be gratified with the delicious taste of that substance, which costs the bees so much labour and pains to procure. Adieu.

CONSIDERABLE

CONVERSATION XXV.

AUGUSTA.

TO-MORROW will be my birth-day ; and as my papa was pleased to express an approbation of my behaviour, during the last twelve-month, he has allowed me the indulgence of giving an entertainment to several of my young friends, among whom, I hope you, madam, will permit me to expect these constant companions of my pleasures and studies.

MRS. HARCOURT.

They shall accept your invitation with my free consent. I think there is no occasion to ask for their own : their countenances express their approbation.

AUGUSTA.

I have already received a present from my aunt upon the occasion. It is a cabinet of
medals

medals of the kings of England, from William the Conqueror to his present majesty.

MRS. HARCOURT.

I hope you will set a proper value upon this mark of her affection, and acquaint yourself with the characters and history of these monarchs.

CECILIA.

I have not a clear idea of the distinction between medals, and coin which passes for money.

MR. HARCOURT.

Medals, though once current as money, among the ancients, are no longer so in the present times. Some medals have never been used for the purpose of money, but have been struck upon some particular occasion, either to perpetuate the memory of an illustrious action, or to transmit to posterity the portrait of a great man, as a far more durable means of preserving his resemblance than a painting on canvass. The ease with which a likeness may be multiplied, by an impression on metal,

metal, is no small advantage in favour of medals.

MRS. HARCOURT.

The study of medals contributes to illustrate many other branches of knowledge. It is not long since Sophia and Charles were present at a lecture upon this subject. I hope they both retain what they heard at that time. Charles, point out those sciences which medals are calculated to enlighten.

CHARLES.

There are few studies of more importance to history than that of medals. The evidence upon which the veracity of an history must rest, is such corroborating testimony as is manifest to every body, and cannot be falsified. Public memoirs, instructions to ambassadors, and other state papers, confirm the veracity of modern history. Such memorials are, however, liable to accidents, and by remaining generally in the countries where they were first published, are incapable of giving that universal satisfaction that should authenticate genuine history. Public buildings, inscriptions,

scriptions, and statues, are more durable monuments; but these are generally obliged, from the nature of things, to remain in particular countries, so that medals alone have the qualities of giving infallible testimony to truth, of possessing the capacity of being diffused through all countries, and of remaining through the latest ages; ascertaining dates, and arranging the order of events. Geography sometimes receives light from medals; their inscriptions frequently pointing out the situations of towns, or their vicinity to some celebrated river or mountain.

MR. HARCOURT.

Medals are also useful to determine whether the ancients were acquainted with certain animals: those which were struck on the celebration of the secular games present the figures of various animals. On many of the Greek medals are representations of several uncommon plants, as well as animals: those of Tyre, in particular, preserve the form of the shell-fish from which the famous purple was procured. The architect receives ad-

vantage from the study of medals, by the exact delineation of many noble edifices that no longer exist, which are seen upon some of them. It is easy to comprehend their general use, upon many subjects connected with a knowledge of ancient events and times. As means of obtaining greater perfection in other branches of science, they are valuable; but if collected merely as objects of curiosity, they lose much of their importance.

CECILIA.

I should never have suspected that they were capable of effecting so many useful purposes, if they had not been pointed out to me.

MRS. HARCOURT.

Charles has detailed the uses of this study with great exactness. But give me leave to suggest an addition, of which, I think, the historic painter may avail himself, by giving the true resemblance of the countenances of those personages whom he represents in his pictures. It frequently happens that the figures of medals are allegorical. Some of the emblems

blems on Roman medals are particularly beautiful. Sophia, shall I impose too hard a task upon you, to ask you to repeat those you heard described.

SOPHIA.

I will endeavour to call them to my memory. Happiness has sometimes the Caduceus, or wand of Mercury, which was thought to procure whatever was desired. In a gold coin of Severus she has the heads of poppies, to express that the greatest bliss consists in the forgetfulness of misfortunes. Hope is represented as a sprightly girl, walking quickly, and looking straight forward. With her left hand she holds up her garments, that they may not impede her pace; whilst in her right hand she displays the bud of a flower, as an emblem of future good. Abundance is imaged as a sedate matron, scattering fruits out of a cornucopia. Security stands leaning upon a pillar, by which is signified her being free from all designs or pursuits: the posture in which she appears, corresponds with her name. A ship sailing before a prosperous breeze,

breeze was the symbol of national happiness. Much taste and ingenuity are displayed in several others, but I am not able to recollect them.

MRS. HARCOURT.

It was not unusual to personify the provinces of the Roman empire on medals, as well as their principal rivers. There is one colonial medal of Augustus and Agrippa, so remarkable for the display of poetical imagery, that I cannot resist giving you a description of it. The conquest of Africa is represented, on the reverse, by the metaphor of a crocodile, an animal then supposed to be peculiar to that country, which is chained to a palm-tree, at once a native of the country and symbolic of victory.

CHARLES.

Before this subject is dismissed, permit me to express the pride I felt at being shown several of the earliest imperial medals, upon which my native island was represented as a woman sitting upon a globe, with a labarum, which
was

was an emblem of military power, in her hand, and the ocean rolling under her feet.

MR. HARCOURT.

May her influence in future be exerted in promoting peace and useful knowledge in Europe, and her superiority in naval strength be no longer the means of destruction to the human species; she will then be entitled to be figured under symbols more intrinsically valuable,

HENRY.

Had I an opportunity of chusing a cabinet of medals, I should prefer those which were the most beautiful to the largest, even if they were of gold.

MR. HARCOURT.

You would show your taste more than your judgment in this choice. Scarcity is the quality that stamps a value upon medals; for connoisseurs, or people who understand the science, totally disregard their size, or the richness of the metal which composes them.

MRS. HARCOURT.

With design to multiply the impressions of those that are scarce, many ingenious contrivances have been used to take them off. Sophia, repeat that simple, easy method with isinglass, which may be practised by any of you with very little trouble.

SOPHIA.

Melt a little isinglass glue, made with brandy, and pour it thinly over the medal, so as to cover its whole surface; let it remain for a day or two, till it is thoroughly dry and hardened; and when it is taken off, it will be fine, clear, and hard as horn, and will give a very elegant impression of the medal or coin.

MR. HARCOURT.

I call upon you, Henry, to name the different coins in gold, silver, and copper, that are now commonly current as money in Great-Britain.

HENRY.

In gold, we have guineas, half-guineas, and seven-shilling pieces; in silver, crowns, half-crowns,

crowns, shillings, and sixpences; and in copper, penny-pieces, halfpence, and farthings.

MRS. HARCOURT.

Very well answered. Money is the general name for that medium which the inhabitants of different nations have agreed to receive in exchange for commodities, and is an invention so ancient, that the commencement of its use cannot be ascertained. When mankind spread over the face of the earth, and were no longer one family, they were obliged to exchange their possessions, in order that each one should obtain a share of the necessaries of life. An example will explain the inconvenience that resulted from this plan. I will suppose that three persons, A. B. and C. lived in the same neighbourhood. A. possessed an ox, but was in great want of a garment. B. had a coat to spare, but was without a house, nor did he know how to build one. C. understood the construction of such houses as were then in use, and stood in need of both food and clothing. These three persons met to endeavour to settle a bargain, but found it impracticable

licable to satisfy the wants of each other by exchange. A. offered his ox to B. for his coat, but he refused it, because C. would not exert his talents in building, unless he could obtain clothing as well as food. Charles, tell me by what means this difficulty would have been settled.

CHARLES.

Money would have rendered it easy. A. in that case, might have sold his ox, and purchased B's coat with part of the price, whilst B. might have recompensed the ingenuity and industry of C. with a sum that would have enabled him to buy food and raiment.

MR. HARCOURT.

Although several nations of Asia, Africa, and America, make use of shells and fruits, as small money, to this day, yet it is most probable, that as soon as metals were discovered, they were generally applied to this purpose, from their superiority in the qualities of firmness, neatness, and durability.

MRS. HARCOURT.

In rude ages, the money they used was
consistent

consistent with their manners, rough and unpolished, both as to the material and the form. It is supposed that when metal was first employed as an instrument of barter, that those who intended to purchase goods carried a mass of it with them from place to place, and provided themselves with instruments to cut off a sufficient quantity for their purpose; but they soon felt the necessity of having the pieces ready cut and weighed. As society advanced, fraud obliged the different governments, or rulers of the states, to affix their stamp upon these pieces of metal, to show that they were genuine. Among other substances used for money in very ancient time, was stamped leather; and, in later periods, necessity has driven civilized nations to have recourse to substitutes of very inferior value. The Hollanders coined great quantities of pasteboard, in the year 1574. Iron bars, quenched with vinegar, served the Lacedemonians for money; and our ancestors, the ancient Britons, used plates and rings, made either of iron or tin.

CECILIA.

Were coins always of a circular form ?

MR. HARCOURT.

Their form as well as the impressions upon them, varies in different countries. In Spain they have coins of an irregular figure. In some parts of the Indies they are square, and in others of a globular form. The shekel of the Jews was stamped on one side with the golden pot that held the manna, and on the other with Aaron's rod. The Dardans stamped two cocks fighting. The Athenian coins were marked with an owl or an ox. Those of Ægina with a tortoise. The Romans sometimes impressed theirs with the image of persons who had been eminent ; but this compliment was never extended to the living, till after the fall of the commonwealth, when flattery induced them to stamp their coin on one side with the head of the reigning emperor ; and since that time the custom has become universal among civilized nations, that of the Turks and other Mahometans excepted ; who, on account of their disapprobation of images, inscribe

inscribe only the name of their prince, with the year of the transmigration of Mahomet their prophet.

AUGUSTA.

How long has our money borne its present form?

MR. HARCOURT.

Guineas were first coined in King Charles the Second's reign, and had their name from the gold of which they were made, being brought from that part of Africa called Guinea. The first coinage of shillings was made by Henry the Seventh, in 1503. Halfpence and farthings were formerly struck in silver by Edward the First, in 1280. The coinage of gold was not generally adopted by the states of Europe before the year 1320, when it was introduced into England by Edward the Third.

CHARLES.

I suppose the discovery of the American continent contributed greatly to increase the gold and silver coin circulated in Europe.

MR.

MR. HARCOURT.

The profusion of the precious metals that flowed into Europe from the mines of South America, reduced their value, and rendered a great quantity of them requisite to purchase the necessaries of life. Had the Europeans received no other advantage from this discovery, it might have been questioned whether it had not produced more evil than good. Agriculture, manufactures, and commerce, form the true riches of nations; these are promoted by a due proportion of gold and silver, used as a medium in barter; but corn and wood, and other commodities, are the real sources of wealth to a community.

HENRY.

Since nothing can be purchased without money, I wonder why poor people do not learn the art of making it, especially when they are in great distress, and want every thing to make them comfortable.

MR. HARCOURT.

It is a capital crime to counterfeit the coin of the realm. The privilege of coining is one
of

of the royal prerogatives : but if an individual who possesses a mass of either gold or silver, has an inclination to convert it into money, he may take it to the Tower, where the British coinage of gold and silver is performed, and it will be returned to him in coin, weight for weight, without incurring any expences. Charles, as I lately carried you to the Mint, which is the office for coining, I expect you will entertain us with a recital of the manner in which this art is performed.

CHARLES.

After they have taken the laminæ, or plates of metal, out of the mould in which they are cast, they make them pass and repass between the several rollers of the laminating engine, which, by being brought gradually closer to each other, give the plates an even and exact thickness. The workman then makes use of a steel instrument, called a trepan : it is hollow, and of a roundish figure, with sharp edges, to cut out as many planchets, or circular pieces of metal, as the plate contains. In order to prepare these planchets for receiving the de-

signed impression, they are compared with standard pieces, to see if they are of a proper weight. Then the superfluous part of the metal is filed or scraped off; and lastly, they are boiled and made clean before they are conveyed to the machine for marking them upon the edge. The principal pieces of this machine are two thin plates of steel, about a line thick. One half of the inscription is engraved on the thickness of one of the plates, and the other half on the thickness of the other. These sheets of steel, or laminæ, as they are called, are straight, although the planchets to be marked with them are circular. One of these laminæ is fixed straight with screws, whilst the other slides by means of a dented wheel. When they stamp a planchet, it is placed between the laminæ in such a manner that the edge of the planchet may touch the two laminæ on each side, and that each of them, as well as the planchet, lies flat upon a copper plate, which is fastened upon a very thick wooden table. The sliding laminæ causes the planchet to turn, so that the edge receives the impression
when

when it has made one turn. Crown and half-crown pieces, only, are thick enough to bear inscriptions on their edges. The coining engine, or mill, puts the finishing stroke to the piece. This machine is so commodious that a single man may stamp twenty thousand planchets in one day. Gold, silver, and copper, are all of them coined with a mill, to which the coining squares, commonly called dies, are fastened; that of the face beneath, in a square box fastened with screws, and the reverse above. In a little box fitted in a similar manner, the planchet is fixed upon the square of the effigy, so as to receive an impression on both sides, in the twinkling of an eye, by turning the mill once round. Thus completed, the coin undergoes an examination of the mint-wardens, who are officers appointed for that purpose, and then is ushered into circulation. I fear my account is scarcely clear enough to be understood; but it is the plainest I can give you, unless you could see the machine.

CECILIA.

I comprehend it very well.

MRS. HARCOURT.

The same process is observed in the coining of medals ; but with this difference, that money, requiring but a small relievo, is perfected at a single stroke of the engine : but for medals, it is obliged to be repeated several times, for the sake of heightening the relievo ; between each stroke the planchet is taken out from between the dies, heated, and returned again, sometimes fifteen or twenty times. Medallions, and medals of a high relievo, are frequently cast first in sand, because of the difficulty of giving them a full impression in the mill, where they are put only to receive a delicate finishing, which the sand seldom gives them.

MR. HARCOURT.

Until the reign of King William the Third, the British coin was made in a different manner, hammers being used instead of the mill. The method then adopted was less commodious, not so expeditious, and in every respect inferior to that now in use. The perfection of this art was reserved for the late Mr. Bolton, of Soho, near Birmingham, where he constructed

structed a most ingenious apparatus, at a large expence, capable of performing all the different operations of coining, as Sophia, who has seen it, will explain more particularly.

SOPHIA.

The whole machinery is moved by an improved steam-engine, which rolls the copper for half-pence finer than copper has ever been rolled for the purpose of making money. It works both the coupleirs, or screw-press for cutting out the circular pieces of copper, and coins both the faces and edges of the money at the same time, with such superior excellence and cheapness of workmanship, as must prevent every attempt to imitate the coin in a clandestine manner; and consequently may prove the means of saving the lives of many unhappy persons from the hand of the executioner. By this machinery, four boys, of twelve years old, are capable of striking thirty thousand guineas in an hour, and the machine itself keeps an unerring account of the number of pieces which are struck.

CHARLES.

Ought not the invention of a machine of such important use, to have entitled Mr. Bolton to the honours of nobility? Titles can never be so nobly bestowed as in the reward of merit; and what merit can claim so large a recompence, as that which rescues our fellow-citizens from destruction?

MRS. HARCOURT.

Merit was the original claim to distinction of rank; but in the present refined state of society, nobility is become hereditary, and ceases to be considered as the reward of personal virtue. As Mr. Bolton lived to see his machine adopted by government, and to be a witness of its beneficial effects, the reflection of having conferred a lasting advantage upon his country, must have been the greatest of all rewards.—The time for repose is at hand. Let each one retire, with a mind disposed to humble gratitude for the blessings enjoyed in the past day. Adieu.

CONVERSATION

CONVERSATION XXVI.

CECILIA.

OUR conversation upon coins has led me to consider that I am extremely ignorant of the nature and properties of metals. I wish I may be obliged with hearing something relative to them this evening.

MRS. HARCOURT.

The subject you have chosen is extensive, and is combined with many branches of the arts: but I am willing to oblige you as far as our time will allow. I suppose you are acquainted with the names of the metals.

CECILIA.

Gold, silver, copper, iron, tin, and lead.

MR. HARCOURT.

Gold is the most valuable; therefore we will begin with it. The qualities which give it this
superiority,

superiority are, purity, ductility, heaviness, and beauty, in which it excels all others. It possesses, in common with other metals, the properties of being fused or melted by fire, and of distending or spreading out under the hammer.

SOPHIA.

I have heard that gold is the heaviest of all bodies.

MR. HARCOURT.

It was believed to be so, till the discovery of a metallic substance called platina, which is as ponderous as gold itself. Gold is more than nineteen times as heavy as its own bulk of water; silver nearly eleven times; copper between eight and nine times; iron something more than seven, and less than eight times; lead eleven; and tin but seven. By comparing gold with the rest, you will be enabled to judge of its superior weight. The next quality I shall remark in this valuable metal, is the cohesion of the particles which compose it: so firmly do they adhere to each other, that it is extremely difficult to separate them.

A wire

A wire of gold, one tenth of an inch in diameter, will support a weight of five hundred pounds, without breaking. From this property arises another, which is its ductility, or capacity of being beaten, pressed, drawn, or stretched out to a surprising degree of thinness.

AUGUSTA.

Is not the leaf-gold we used to buy for gilding of pictures, beaten thus?

MR. HARCOURT.

Yes; the expansion of the metal in that process is almost beyond imagination. M. Reaumur asserts, that, in an experiment he made, one grain of gold was extended to rather more than forty-two square inches of leaf-gold; and that an ounce of gold, which, in form of a cube, is not half an inch, either high, broad, or long, is beat under the hammer, into a surface of one hundred and forty-six and a half square feet.

HENRY.

How astonishing! Do tell us how this wonderful operation is performed.

MR.

MR. HARCOURT.

A block of black marble, of several hundred pounds weight, with a square surface, about nine inches each way, fixed in a wooden frame, serves for a table to beat the gold upon. Three of its sides are guarded by a high ledge, and the front, which is open, has a leather flap fastened to it; this the gold-beater uses as an apron, to preserve the fragments of gold that fall off. For this purpose the purest gold is melted in a crucible into ingots or pieces of six or eight inches long, and three quarters of an inch wide. This bar of gold is made red hot, and forged on an anvil into a long plate, which is further extended, by being passed repeatedly between polished steel rollers, till it becomes a ribband as thin as paper. This is divided into equal pieces, which are again forged till they are an inch square. These squares are interlaid with leaves of vellum, three or four inches square: both are confined tight with cases of parchment, placed in contrary directions. The whole is then beaten with the heaviest hammer, till the gold

gold is stretched to the extent of the vellum. In this state the sheets of gold are then taken out, and cut in four with a steel knife. These pieces are now intersected with the leaves of the fine skin of an ox-gut, properly prepared, five inches square. They are again beaten till they are extended to the size of the pieces of skin : the same operations of dividing and beating are repeated the third time. Nothing remains to finish the process, but cutting the edges even, with a machine adapted to the purpose, and fixing the leaves of gold in books, the paper of which is well smoothed and rubbed with red bole, that it may not stick to them.

SOPHIA.

I suppose the gold-beaters' skin, which is used for healing cuts and scratches, is the same which you mention to be prepared from the gut of an ox.

MR. HARCOURT.

You conjecture rightly.

MRS. HARCOURT.

Although the distension of gold is so great
under

under the hammer, it is vastly exceeded by the art of the wire drawer.

AUGUSTA.

I should have thought that impossible.

MRS. HARCOURT.

There are gold leaves yet thicker in some parts than the three hundred and sixty thousandth part of an inch : but that is inconsiderable when compared with the extreme thinness of gold spun for laces and embroidery. Gold thread is only silver wire gilt, or covered with gold. An ingot of silver, usually about thirty pounds weight, is rounded into a cylinder, or roll, about an inch and a half in diameter, and twenty-two inches long. Two ounces of gold-leaf are sufficient to cover this cylinder ; sometimes it is effected with little more than one. But this thin coat of gold must be yet vastly thinner. The ingot is repeatedly drawn through holes of the several irons, each smaller than the other, till it be finer than a hair ; every new hole diminishes its thickness ; but what it loses in circumference it gains in length, and consequently

quently increases in surface; yet the gold still covers it; it follows the silver in all its extension, and never leaves the minutest part bare, not even to the microscope. How inconceivably must it be attenuated, when the ingot of silver is drawn into a thread, the size of which is nine thousand times less than it was at first.

CECILIA.

This almost exceeds credibility.

MRS. HARCOURT.

As inconceivable as it appears, the ingot is not yet extended to its full length. The greatest part of our gold thread is spun, or wound on silk; and, before they spin it, they flatten it, by passing it through two rolls, or wheels of exceedingly well polished steel, which operation lengthens it one-seventh, and, of course, diminishes its thickness, as well as increases the extension of the gold which covers it, to such an exquisite thinness, that M. Reaumur calculates that it is reduced to less than the three millionth part of an inch!

SOPHIA.

Imagination can scarcely follow such nice calculations. The fineness of the spider's web, with which we were amused some time ago, is the only thing that I know of which bears any comparison with it. Glass, I think, possesses a capacity also of being drawn into threads. I remember to have been shown what they call spun-glass, when I was at the glass-house; it resembled a skein of fine silk, and formed a pretty ornament for a head-dress.

MRS. HARCOURT.

Several other substances possess a degree of ductility, but very inferior to that of gold. Gums, glues, resins, and some other bodies, may, when softened by water, be drawn into threads. Silver we have just proved to be ductile; the rest of the metals have this property, more or less. Gold undergoes the operation of fire without the smallest diminution. Platinum and silver are the only metals besides, which do not lose their metallic appearance,

and either evaporate in flame, or change into an earthy or glassy form.

CHARLES.

This accounts for a comparison which I have frequently heard, of virtue resisting temptation, as gold tried in the fire.

MR. HARCOURT.

This power of resisting the action of fire, peculiar to these metals, has given them the denomination of perfect, in opposition to the rest, which are called imperfect, because they are reduced by being kept long in a fierce fire, to a calx, which, you may recollect, is used by the enameller.

SOPHIA.

Are not metals said to be alloyed, when they are mixed with an inferior kind?

MR. HARCOURT.

Yes; gold and silver coins are never struck without an alloy of copper. The softness of these metals is the principal reason for their being mixed or alloyed, with design to render them harder. Were not gold so

rare, it would be admirable for many domestic utensils, as it never rusts nor tarnishes.

CECILIA.

Nothing could be so beautiful as gold for such purposes. Its brightness, its colour, and cleanliness, to say nothing of its magnificence, would give it a superiority to every other metal. Is this precious substance peculiar to any one part of the globe?

MR. HARCOURT.

The knowledge that Charles has acquired of the productions of different countries, will enable him to reply to this question.

CHARLES.

It is found in all the known parts of the earth, though very unequally with respect to purity and abundance. The most considerable mines in Europe are those of the Upper Hungary, and particularly that of Chremnitz. America yields the greatest profusion of gold of any of the four quarters of the world. Peru, Mexico, Chili, and other provinces of the Spanish West Indies, to which I may add the Brazils, abound with it. When the Spaniards

Spaniards first visited these countries, they found a temple, the walls of which were covered with gold.

HENRY.

I wish it were so plentiful in England, we might then use it as commonly as the ordinary metals.

SOPHIA.

Let us be contented with the use of iron and the other inferior metals, which are well adapted to most of our domestic wants, without coveting the riches of the Peruvians ; to these harmless people they were a source of the greatest misfortunes.

AUGUSTA.

How so ? I thought wealth had always been a sign of national prosperity.

SOPHIA.

You have already forgotten what papa remarked upon that subject last night, or you would have been of a different opinion. The richness of the Peruvian mines attracted the covetousness of the Spaniards, by whose rapacity their government was subverted, and the whole nation finally destroyed.

HENRY.

Poverty is then a means of security. Had they been as poor as the Greenlanders, they might have still enjoyed their own territories unmolested. But Charles has not told us which are the other countries where gold is mostly found.

CHARLES.

In many parts of Asia, especially in Sumatra, Pegu, China, Japan, the Philippine Islands, and Borneo, it is found in considerable quantities. The coast, as well as the interior parts of Africa, likewise produce a great deal of gold.

CECILIA.

All gold is not found in mines. I think I have heard that it is frequently collected from the sand and mud of rivers and torrents.

MR. HARCOURT.

This happens more frequently in Guinea than elsewhere. There are many European rivers also which roll particles of gold among their sand. Those rivers yield the greatest plenty whose coursé is slow and uninterrupted, and

and where the sand is of a reddish or blackish hue, which, being heavier than the white sand, carries the gold along with it to the bottom. Among the rivers in Europe which produce gold, are, the Rhine, the Rhone, the Garonne, the Danube, and the Elbe. The collection of these scattered grains of this precious metal, affords a bare subsistence to some of the neighbouring inhabitants.

AUGUSTA.

It must be tedious work to pick it from the sand.

MR. HARCOURT.

Experience and ingenuity have invented a more expeditious method than that. The sand is received into a long, sloping trough, lined at the bottom with flannel, or coarse cloth : upon stirring the water about with the hand, the sand is washed off, and the small particles of gold subside into the woolly matter of the flannel : they are afterwards carefully washed out. Gold is sometimes found in mines, in small pieces of different forms and sizes, though but seldom in masses so large as an ounce. At
other

other times it is dug up in the stony glebes, or clods, which are called the mineral, or ore of gold. These clods generally contain a mixture of other metallic matter, particularly silver. They are of various colours, and generally lie at least one hundred and fifty fathoms deep. In order to separate these glebes from the gold they contain, they are first broken into small pieces with iron mallets, and then carried to the mills to be ground to a very fine powder, which is infused in a solution of common salt, in wooden troughs; it is afterwards refined, from the mixture of foreign substances and dross, by mercury.

MRS. HARCOURT.

Mercury, or quicksilver, possesses the quality of uniting with the other metals in the form of a paste, which chemists call an amalgam. An amalgam of gold may be procured by heating ~~it~~ red hot, and then pouring heated quicksilver upon it. After which the mixture is to be stirred with an iron rod, till it begins to rise into smoke. To finish the process, it ~~is~~ thrown into a vessel full of water, where it hardens,

hardens, and becomes fit for use. Gilders and goldsmiths avail themselves of this means, to render gold more applicable to their purposes. Suppose they have occasion to gild a piece of copper, as the lid of a snuff-box, for example, or any other toy, they cover it with a layer of the amalgam, and then place it in a proper vessel over the fire. The quicksilver evaporates by the heat, and the gold only is left upon the surface of the copper.

SOPHIA.

Knowledge is not only agreeable, but of the greatest utility in the most common arts of life. How long a time it would have cost a person, ignorant of this process, to have gilt a button or a thimble!

MRS. HARCOURT.

The progress of knowledge is gradual: one discovery leads to another. Without the advantage of the experiments of others, it is likely that a man might spend his whole life without hitting upon the means of effecting a process, which, when known, appears so simple and easy. This art enables goldsmiths to
recover

recover the filings and small particles of gold which are accidentally scattered amongst the sweepings of their shops.

AUGUSTA.

The various rich toys in a goldsmith's shop are very amusing. I think it is one of the most elegant of all retail trades.

MR. HARCOURT.

To be properly qualified in this business requires skill in several arts. The accomplished goldsmith should have a good taste for design and sculpture, that he may be able to form his own moulds; and should understand metallurgy, or mixing of metals, sufficiently to give them the proper alloy.

CHARLES.

I did not know that the metal was cast into the different forms.

MR. HARCOURT.

The goldsmith's work is either performed in moulds, or by beating out with a hammer. Works that have raised figures are cast in moulds, and afterwards polished. Plates or dishes, of silver or gold, are beat out from thin plates ;

plates; and tankards, and other vessels of that kind, are formed of plates soldered together, and their mouldings are the work of the hammer. There is a great improvement in the goldsmith's art, for they were obliged formerly to hammer the metal from the ingot to the requisite thinness; but now flattening mills are used, which reduce metal to the desired thinness at a very small expence.

CHARLES.

Are there many different kinds of workmen employed by the goldsmith?

MR. HARCOURT.

Luxury and opulence occasion so great a demand for the productions of the goldsmith, in the metropolis of a rich commercial nation, as London is, that it encourages many to excel in the different branches of the art, and supplies the artificers with employment, though they may be divided into many kinds; as the jeweller, the snuff-box and toy-maker, the silver-turner, the gilder, the burnisher, the chaser, the refiner, and the gold-beater. As we have deduced gold from the mine to the hand

hand of the consumer, we will proceed to some particulars relative to silver, if you are not weary, children, of the subject.

SOPHIA.

I can speak for myself, that I have been so well entertained, I shall be highly gratified by hearing the properties of all the rest of the metals.

ALL.

We are all of one mind.

MR. HARCOURT.

Silver is the most precious, the finest, the purest, and most ductile of all the metals after gold, and possesses many of the same properties, though not in so great a degree: its ductility, or capacity of extension, has already been instanced, in the fineness to which the wire is drawn that is to be covered with gold. It is as fixed and indestructible as gold, bearing the action of fire, without a diminution of its weight. It contracts no rust, but is very apt to tarnish, as you may have often observed. It is harder than gold; and if you take the silver mug, and ring it, you will perceive that

that it has a sonorous quality. Charles, I shall not infringe upon your office of pointing out the countries whose silver mines are the most productive.

. CHARLES.

Every quarter of the globe contains some veins of this mine; nor is our own island destitute of it: for although we cannot boast of any silver mines, properly so called, yet several of our lead-mines yield a considerable proportion of silver. It is said that Sir Hugh Middleton, the projector of bringing the New River from Ware to London, was enabled to prosecute his useful design, by which a great part of the inhabitants of the metropolis is supplied with water, from the silver produced by his lead-mines in Wales. The mines of Peru, and other parts of South-America, are much the most abundant of any known; particularly those of Potosi, which continue to repay the labour of the miners, notwithstanding the immense quantities that have been dug out of them. Instead of finding the ore near the surface, as they formerly did, the work-

men are now obliged to descend to prodigious depths, in order to obtain it. So poisonous are the exhalations which issue from them, that many thousands of Indians have perished in them, and prodigious numbers are still sacrificed by avarice there, every year. The cattle which graze on the outside are affected by the pernicious fumes; but so great is their power over the miners withinside, that none of them can resist their influence above a day together. As a means of prevention, these poor people drink an infusion of an herb called paraquay.

CECILIA.

Our rich sideboards of plate may then be said to be purchased at the price of the health and lives of our fellow-creatures.

MR. HARCOURT.

Mining is, in many respects, a dangerous and disagreeable employment; but views of present advantage will induce the ignorant and inconsiderate to undertake any task, however objectionable. Silver is found in different states. It is called virgin, or native silver, when

when it occurs naturally alloyed with copper and gold ; but this is but rarely to be met with. When it does happen, it is usually in fibres, grains, or crystallizations, lying in different substances, as flint, spar, slate, &c. but it is generally found in a mineral state, by which I mean, united with matter foreign to itself. Silver is capable of being alloyed with all metals, and forms different compounds with them, according to the nature of the mixture.

SOPHIA.

Although the exhalations of silver mines are so poisonous, silver is thought the wholesomest of all metals, which is the reason that spoons are generally made of it, and saucepans, where people can afford it. Grandmamma has one, which she lays aside for the use of any of the family who are indisposed.

MRS. HARCOURT.

Gilding and silvering are performed by processes very similar to one another, whether on metal, wood, leather, or paper. The method

by amalgamation you have already heard. In many cases, the substance intended to be gilt is daubed over with size composed of different materials, and the gold or silver leaf laid upon it.

HENRY:

O, that was the way my brother used to gild the carp in the fish-pond.

MRS. HARCOURT.

How was that? Charles, you must tell us your secret.

CHARLES.

I made a mixture of Burgundy pitch, powdered amber, and several other ingredients, and after rubbing my fish quite dry, I smeared him over with it, and then pressed on the gold-leaf gently with my hand; upon which I dismissed my poor prisoner, with his splendid habit, to his native element, better pleased with his release than with his new finery, which he did not understand.

MRS. HARCOURT.

Late as it is, I cannot refuse you the pleasure of hearing a pretty experiment made by an
incorporation

incorporation of aquafortis with silver and mercury, which being put into water, the silver expands and shoots itself into an appearance of a tree, with branches, leaves, and flowers. The result, chemists distinguish by the name of *Arbor Dianæ*, or Tree of Diana. It is beyond our usual hour of retirement.--- Adieu; we will resume the same subject to-morrow.

CONVERSATION XXVII.

AUGUSTA.

I THINK you told us, that the experiment which produced the silver-tree, was called the Tree of Diana. I see no reason, why it should be appropriated to that goddess.

MRS. HARCOURT.

I am glad you have proposed this question; it affords me an opportunity of mentioning
Y 3 the

the chemical names of the metals, of which you ought not to be ignorant. From what motive it is difficult to say, but chemists have named each of the metals after one of the planets. Thus gold is called Sol, after the sun, perhaps from the brilliancy of its colour. Silver is called Luna, or the moon, to the beams of which its whiteness bears an allusion ; hence the name of this experiment, as Diana was a figurative representation of that planet. Copper is Venus ; and iron Mars, which is very suitable, as Mars is the god of war. The activity of Mercury is adapted to quicksilver. Tin is called Jupiter ; and lead Saturn.

CECILIA.

Copper comes next to gold and silver : has it any of their qualities ?

MR. HARCOURT.

There are some properties common to all metals, which distinguish them from every other substance, and determine them to be metals. By reflection, it is likely you will be able to find some of them out.

SOPHIA.

SOPHIA.

All the metals that I know are shining, and opaque or solid, without the least degree of transparency, which I suppose is the cause of their reflecting light, and answering, when polished, to the purposes of a mirror.

CECILIA.

Heaviness is a distinguishing quality, as is also a capacity of being fused or melted by fire; and when hardened again into a solid mass by cold, the facility with which they are expanded under the hammer must not be forgotten.

CHARLES.

To which let me add their ductility, or power of being drawn out to such a surprising length.

HENRY.

You have all omitted saying, that they are found in the bowels of the earth.

MR. HARCOURT.

Well remembered, Henry. But to return to the peculiar properties of copper. It is harder than either gold or silver, and is both malleable

malleable and ductile, as it may be drawn into a wire as fine as a hair, or beaten into leaves as thin as those of silver. In a great fire, with free access of air, it smokes, loses part of its weight, (for I suppose you recollect that it is an imperfect metal,) and imparts beautiful green and blue colours in the flame.

SOPHIA.

A fire I once saw, made of wood, among which a quantity of copper-dust had been accidentally scattered, showed all the colours of the rainbow.

MR. HARCOURT.

The colour of copper, inclining to a dullish red, you are all, undoubtedly, acquainted with. This metal is procured in several parts of Europe, but most abundantly in Sweden. It is found in glebes, or stones of various forms and colours; which are first beaten small, and washed, to separate them from the earthy particles with which they are mixed; after washing they are smelted, and, when in a state of fusion, the melted matter is run into a kind of moulds, by which it is formed into large blocks.

blocks. The operation of melting is repeated more than once, which, with the addition of a certain proportion of tin and antimony, renders it more pure and beautiful.

CÆCILIA.

Is not that green stuff, which is called verdigrise, that I have seen upon your dirty saucepans, the rust of copper?

MRS. HARCOURT.

Yes, my dear. It is so extremely subject to contract rust, being corroded or dissolved by all acids, as well as salts, that I have long discontinued the use of copper vessels in my kitchen, as being very pernicious to health, unless the most exact nicety be observed in the cleaning them. Many persons have been severely indisposed from the effect of the poison of copper, though it might be expected that the nauseous taste of the verdigrise would be a warning of the danger. The metal itself, when heated, has both a disagreeable taste and smell.

HENRY.

HENRY.

You have quite forgotten to mention brass among the metals.

MRS. HARCOURT.

Brass is a composition of copper, fused with *lapis calaminaris*, by which it is rendered harder, and becomes of a yellow colour. It is rather lighter, harder, and more sonorous than pure copper; and melts easier: but, if heated even a little, is apt to crack and fall in pieces under the hammer, for which reason it is generally cast into the form required, and polished afterwards. The beauty of its colour, and being less subject to rust than copper, recommend it for the purposes of many domestic utensils. A gold colour may be imparted to brass, by first burning it, then dissolving it in aquafortis, and lastly reducing it to its metalline state: or it may be whitened by heating it red hot, and quenching it with water distilled from *sal-ammoniac* and egg-shells.

CHARLES.

The Corinthian brass was highly valued
among

among the ancients : was that merely a mixture of copper and calamine ?

MR. HARCOURT.

It is certain that it was a metallic composition of great beauty, and prized but little below gold : but many doubt the relation of Pliny, who says that it was a mixture of metals, occasioned by the conflagration of Corinth, when that city was taken by L. Mummius, 146 years before Christ.

SOPHIA.

Bell-metal bears some resemblance to brass. Is that also a composition ?

MR. HARCOURT.

It is composed of a due proportion of copper and tin. In the metal of which cannon is made, the copper is mixed with various ingredients of a coarser nature ; to make it run close and foundler well. Before we dismiss the subject of copper, it may be proper to specify the uses to which it is most commonly applied.

CHARLES.

As I was passing by a copper-smith's, a
little

little while since, I stood some time to observe the men at work: they were making large vessels for the purpose of boilers, to which, they told me, copper was particularly adapted, from the ease with which it could be hammered out to a proper thinness. There was also a vast number of sheets of copper, prepared for covering the roofs of houses, and sheathing of ships: by this contrivance, their holds are defended from worms, and the smoothness of its surface contributes to the swiftness of their sailing.

CECILIA.

Copper is likewise essential to the engraver. The finest prints are engraved upon sheets of that metal.

MRS. HARCOURT.

Perhaps we may enlarge upon this topic at some future opportunity. It is now time to turn our thoughts upon iron, which is the hardest of all metals, and the most extensively useful of any of them: next to gold it has the greatest tenacity of parts, or difficulty of being broken; is very elastic; and requires
a great

a great degree of heat to put it in a state of fusion. The hardness, brittleness, and capacity of yielding to the hammer, varies in iron, according to the nature of the ore from which it is obtained, and the operation it has undergone. Cast-iron is that which is run from the ore, and, from a mixture of crude earth, is so hard as generally to resist the file or the chisel : it is likewise brittle and unmalleable in this state ; but is rendered tough by the operation of forging, which is performed by heating it red hot, and then striking it with large hammers, which force a quantity of vitreous matter out of it. Steel is only a more perfect kind of iron, produced by fusing bars of the purest iron in an earthen crucible, with a cement of charcoal, wood-ashes, and different animal substances ; such as bones, horns, skins, or hair. The metal, in consequence of this change, acquires a more compact and close-grained texture, and becomes harder, more elastic and tenacious, as well as more fusible. Different degrees of elasticity and brittleness

may be given to steel, according to the uses for which it is designed.

CHARLES.

Papa's sword affords specimens of both qualities : the fine-polished handle is very brittle, as he observed, when he broke it by hitting it against a chair, and the blade is so flexible, it will bend almost double without breaking.

MR. HARCOURT.

Flexibility is an essential requisite in a sword ; for a soldier would presently be exposed to the power of his enemy, whose weapon was easily broken.

SOPHIA.

Without the elasticity of steel, we should be deprived of the accommodation of watches. I think they are moved by steel springs.

MRS. HARCOURT.

Steel watch-springs are chiefly made at Geneva, by children.

AUGUSTA.

Pray, what method is taken to give them that blue colour, of which I have frequently seen them.

MR.

MR. HARCOURT.

Polished plates of steel, put upon a gentle charcoal fire, acquire different colours on their surfaces, and pass through several shades, according to the degrees of heat ; becoming first white, then yellow, orange, purple, violet, and lastly blue. The hardness of steel renders it capable of receiving a sharp edge, which adapts it peculiarly for the blades of all instruments for cutting, such as knives, razors, scissors, &c.

CECILIA.

Ornamental works of polished steel are extremely beautiful ; their brilliancy is exquisite ; and I have heard that the workmanship raises them in value to nearly the equivalent of silver and gold.

MR. HARCOURT.

Steel is most suitable to all purposes of nicety, where polish or flexibility is requisite ; but iron is applicable to some of the most important uses of life, where strength, rather than beauty, is necessary ; such as anchors, plough-shares, horse-shoes, chains, bars, and nails. Cast-

iron is useful for pots and cauldrons, grates and stoves. Cannon and cannon-balls are also made of it.

CHARLES.

The uses of iron and steel cannot be enumerated: most tools, both in husbandry and other arts, are made of one or the other. But it has the great defect of being very subject to rust.

AUGUSTA.

When I was out of health, I was ordered to drink water from a chalybeate spring, which my governess said was impregnated with iron.

MRS. HARCOURT.

Water, which imbibes particles of iron as it runs beneath the surface of the earth, is recommended as beneficial in several disorders. Iron is given as a medicine in many forms; and is thought to possess considerable power as a bracer of relaxed habits.

SOPHIA.

Is not the leadstone a kind of iron?

MR.

MR. HARCOURT.

It is a species of iron ore, which is both hard and heavy : it possesses extraordinary powers, attracting iron to itself, and communicating this property to any piece of iron that is rubbed with it ; but what renders it of most important advantage in civil life, is a peculiar propensity which it has of pointing to the poles of the earth. The ingenuity of man has applied this unaccountable quality to the construction of the compass, by which ships are guided in their course over the trackless ocean. Iron is the produce of all mountainous countries : the northern parts of Europe supply us with great quantities of this most useful metal. The tops of ferruginous mountains are frequently crowned with resinous trees, such as the pine, the fir, and the cedar, the charcoal of which is particularly adapted to melting the iron. These trees are often covered with mosses, some species of which catch fire from the smallest spark. Thus nature has placed those materials on the same spot which require the

assistance of each other to render them subservient to the uses of man.

CECILIA.

Although other countries excel Great Britain in rich mines of gold and silver, she is celebrated for her tin mines. Cornwall and Devonshire abound in this metal; and I have read that the Phoenicians, a people of Asia, traded to this country for that article, several hundred years before the Christian era.

MR. HARCOURT.

The application of the information we gain from books on proper occasions, is the best end of reading; for merely turning over a great number of volumes, without increasing our knowledge, is a waste of time. Tin is of a whitish colour, softer and less elastic than any other metal. The ore of tin is the heaviest of all metallic ores, though tin is the lightest of metals, which arises from a combination of other substances. When bent, it makes a crackling noise, fuses easily, and calcines, long exposed to the fire. It possesses the
capacity

capacity of malleability, but not that of ductility.

MRS. HARCOURT.

In the Cornish mines, large pieces of timber entire, are sometimes found by the miners at the depth of forty or fifty fathoms; but it is difficult to account how they came there, unless it were at the time of the deluge, or some other violent convulsion of nature.

AUGUSTA.

Are the uses of tin very considerable?

MR. HARCOURT.

The form in which we generally see it, is, combined with other metals. Its cleanliness, and freedom from rust, are the causes of its being used as a lining for copper vessels, by which means they are rendered safe for the purposes of cooking, &c. The tinned ware in common use, are plates of iron covered with tin. The plates are first steeped in an acid water, till they are a little corroded; they are then scoured with sand, by which they are made very smooth and fine. Thus prepared, they are dipped into boiling tin; when cool, ~~the~~

they are ready to be formed into various utensils.

HENRY.

How are they joined together, when they are required to make any thing round, as a mug or tea-kettle?

MR. HARCOURT.

They are soldered with a mixture of tin and lead. A solution of tin in aquaregia, added to the tinctures of cochineal, gum-lac, and some other red tinctures, heightens their colour, and changes it from crimson or purple, to a fine scarlet. The superiority of our fine scarlet cloths is attributed to the addition of this ingredient in the dye.

MRS. HARCOURT.

Tin is used in the making of looking-glasses, or at least in giving them their power of reflection. A sheet of tin foil, made similar to leaf-fold, is laid down, perfectly smooth, upon a stone slab, and as much quicksilver poured over it as is sufficient for the glass to swim on, it being previously well cleaned with powdered chalk or whiting: the glass is then covered

covered all over with small leaden weights, to press it down, and the stone is raised at one end for the superfluous quicksilver to drain off: the whole of the tin foil and quicksilver are incorporated, the weights are removed, and the mirror finished. Pins are made of brass wire, and blanchéd or silvered with a preparation of tin.

CHARLES.

Is not tin an ingredient in pewter?

MR. HARCOURT.

Pewter is composed of tin and other substances mixed with it. It was formerly much used for dishes and plates, but is almost banished by the general use of earthen ware, which is cleaner and pleasanter in every respect, except that of retaining heat, in which it is excelled by the pewter.

SOPHIA.

Pewter has a great resemblance to lead, which, I think, is the next of which we are to treat.

MR. HARCOURT.

Its colour is a little like it. Lead is a
course

coarse, soft, impure metal, but a very useful one. It is so soft and flexible, that it is easily cut with a knife; shaved with a plane; grooved for windows, by being drawn through the glazier's vice; or flatted into large thin sheets, by passing it between wooden rollers. It has less malleability than the other metals we have already described; and no capacity of being drawn into wire, which arises from a want of tenacity. Lead is easily fused, and melts long before it becomes red-hot: as soon as it becomes fluid, it calcines, and greyish ashes are formed upon its surface. When in a middle state between heat and cold, it is readily formed into small, round grains. Thus shot is made of it, by infusing a due proportion of yellow orpiment in it, and then pouring it through a plate of copper, bored with holes, of a suitable size, like a cullender, through which the liquid metal passes, and subsides in round balls or grains.

AUGUSTA.

Pray, what are the compositions which form red and white lead?

MR. HARCOURT.

Red-lead is a preparation of the metal whose name it bears, by calcination, and long exposure to a strong flame. White-lead is formed of its calx, obtained in the fume of vinegar. All acids have the power of dissolving it. This last is of great service to the painters, both in oil and water colours. The discovery of a substitute for it, in house-painting especially, is much to be desired, on account of its extremely pernicious qualities to the health of the workmen who use it. It is also an ingredient in cosmetics, for beautifying the complexion.

MRS. HARCOURT.

The custom of painting the face becomes those only who have effaced the native hues of youth, by late hours and high living; but is entirely inconsistent with purity or simplicity of manners, the most enchanting graces that women can assume. The baneful effects of this dangerous poison are visible in the countenances of those who make use of it, by their haggard looks and premature old age.

MR.

MR. HARCOURT.

Lead is used in paintings with oil, not only as a colour, but as a dryer. It is likewise serviceable in assisting the melting of enamels and porcelain, and is the general basis of the glazing of pottery wares. The refiner finds it of great benefit in cleansing and assaying the most perfect metals.

HENRY.

Lead seems to be a very useful metal. I know of several purposes to which it is applied.

MRS. HARCOURT.

It is also subject to be abused, its poisonous quality rendering it highly dangerous to be taken internally, unless regulated by the judgment of a skillful physician. Avarice has induced some unprincipled persons to infuse salt of lead into wine turned sour, with design to recover it. Lead is administered externally for wounds and ulcers; and Goulard, so much approved for its efficacy in inflammation, is prepared from the extract of lead. Now,
Henry,

Henry, favour us with what you have observed on the subject.

HENRY.

Houses are covered with lead : gutter-pipes, and cisterns are made of it; but I do not know how it is formed into sheets for these uses.

MRS. HARCOURT.

Large blocks, called pigs of lead, furnished from the lead works, are melted by the plumbers into shapes, by running the metal, when liquid, into moulds of brass, clay, or plaster. The lead intended for large sheets, to cover the roofs of houses and churches, is melted in a huge cauldron or furnace, and poured with ladles upon a table of extensive dimensions, covered with fine sand, and guarded with ledges. Pipes are sometimes cast; at others, they are made of a flat piece rolled round, and soldered together.

CHARLES.

Lead is found in various countries, but it abounds particularly in England. Cornwall, Devonshire, and Somersetshire, yield a consi-

derable quantity. Nor are our mines confined to the West : Derbyshire, Northumberland, and Durham, boast of some which are valuable. Wales, likewise, is very productive in this article. So poisonous is the quality of the ore, that in the neighbourhood where it is dug, neither cat, dog, nor fowl can be kept. Silver is mostly found mixed with it, but often in such small proportions as not to repay the expence of separating it.

CECILIA.

Is the black-lead, of which pencils are made, composed of that metal ?

MRS. HARCOURT.

That substance, for it is not a metal, is produced in England, particularly in Cumberland. For the purpose of making it into pencils, it is sawed into slips, and fitted into a groove of some soft wood, like cedar, and another slip of wood glued over them. I cannot dismiss our subject without remarking the abundance and variety of materials which nature offers to her children, as objects for the exercise of their understandings and industry.

The

The globe is covered with vegetation; the ocean abounds with treasure; animals of every order fill the air and inhabit the earth; whilst its bowels conceal the riches of the mine: but, to the uncivilized savage, the principal part of these gifts are useless. The exertion of the intellectual faculties, application, ingenuity, and the multiplied wants of refined society, are requisite to apply them to beneficial purposes. The gradation of being, from a polype to a man, are numerous. The distinctions between a savage and a philosopher are likewise great, though individuals of the same species. The advantage we enjoy of being born in a state of civilization, enables us to aspire to a degree of improvement characteristic of the latter. Do not let us be deprived of this superiority by sloth and inattention, but by a daily exertion of the talents bestowed upon us, let each of us endeavour to acquire useful knowledge, which is at once the ornament and companion of virtue.

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